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MAGNETISM—PART II.

By L. S. Brainerd.

This article will treat on measuring the permeability of samples of iron. There are four methods of measuring the permeability of iron experimentally: First—The magnetometric methods. These consist of surrounding a sample of the iron by a coil, and noting the deflection produced by its magnetization in a magnetometer. Second—Balance methods. These are a modification of those just described, a compensating magnet being used to balance the effect upon the magnetometric needle, produced by the magnetism. These methods, while very good, are not to be compared with the inductive methods. There are several varities of these, but all depend upon an instantaneous induced current being generated in an exploring coil, surrounding the specimen. The strength of this current is, of course, proportional to the

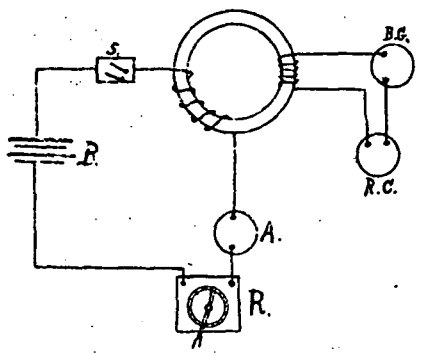

FIG. 3.

number of lines, introduced into, or withdrawn from, the coil. It will be readily seen how we may measure the flux through a bar of iron by measuring this induced current. One of these induction methods, known as the ring method, is shown in Fig. 2, where B is the battery used to magnetize the iron being tested, (S), the switch for controling and reversing the current (R), a rheostat for adjusting the strength of the current, (A) an ammeter, and B G a ballastic galvanometer, the first swing of which measure the strength of the induced current. R C is an earth indicator or reversing coil, by means of which the readings of the galvanometer are calibrated. In making this test it is customary to begin with a feeble current and gradually increase it until the highest values required are reached. The values of H are calculated from the observed value of the current by the following formula: Let I equal strength of exciting current in amperes, I the number of turns in the exciting coil, and L the mean circumference of the ring in centimeters.

Then H =

$$\frac{4 \times 3.1416}{10} \times \frac{S \times I}{L} = 1.2566 \times \frac{S \times I}{L}$$

In order to illustrate this method let us make an imaginary test. We will suppose we have a ring of iron having a cross section of one square centimeter, and wound with an exciting coil, also with an exploring coil of 100 turns of fine wire. The reversing earth coil is of such construction that when it is turned over the effect is equal to cutting 840,000 lines of magnetic force once. We will now adjust the resistance in the circuit so that when this coil is suddenly turned over, the swing of the galvanometer needle, due to the induced current is 8.4 divisions on the scale. Now since there are 100 turns in the exploring coil, it follows that in the test when we get an induced current from the ring, each division on the scale means 1,000 lines of force in the iron. Now turn on the current and the needle swings, suppose to 11 divisions, or since each division means 1,000 lines in the iron, this magnetizing force produces 11,000 lines in the iron, but the cross-section of the ring is one square centimeter, therefore, B= 11,000. To find the value of H, suppose the exciting coil has 180 turns, and the current is one ampere, then the excitation is 180 "ampere turns." Applying our formula, we get 7 as the value of H. If B=11,000 and H=7, the permeability is about 1,570.

Another important method of obtaining the above data is that known as the "Divided Bar Method." This consists as shown in Fig. 3, of a block of iron having an oblong space, into which the exciting coils are placed. The sample of iron to be tested consists of two bars turned true and fitted to holes in the ends of the iron block, and making contact at their ends. The exciting coils do not occupy the entire space inside the block, but are separated far enough to allow the exploring coil to be introduced. One of the rods is fastened permanently in the block, while the other is movable. The exploring coil has a ballastic gal-

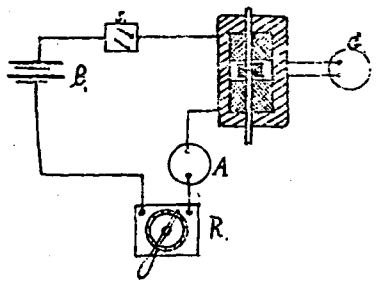

FIG. 3.

vanometer (G) in series with it as in the method just described, and an ammeter, (A) and resistance (R) in circuit with exciting coils. Observations are taken by breaking the circuit and at the same instant withdrawing the rod. There are many other good methods of experimentally obtaining the magnetic qualities of iron, but it is not the object of this paper to consider more than a few typical methods.

When a piece of iron has been magnetized and then the circuit broken, it is well known that there is considerable residual magnetism retained by the iron. The amount of this residual magnetism depends almost entirely upon the hardness of the iron, a hard piece of iron retaining much more than a soft piece which has been subjected to an equal magnetizing force. For purposes where the magnetism is not subjected to reversals of polarity, as in field magnets of dynamos, this is not of much consequence, but where the polarity is constantly and rapidly reversed, as in armatures and alternating current apparatus, it is of vital consequence. This will be

readily seen if we consider what takes place in the iron in question during one complete reversal of polarity. First the exciting current magnetized the iron in one direction, then the circuit is broken, and the magnetization drops to a certain extent, depending upon the quality of the iron. Now the current is thrown on in the opposite direction, and its first work is to neutralize this residual magnetism, before it can do any useful work. This loss is known as the hystereses' loss, and in alternating current apparatus especially, is of no small consequence, producing a heating of the iron as well as a loss in efficiency of the machine.

The only means of reducing this effect is to use very soft iron, and work it at as low a magnetization as is practicable. We now see what an important part is played by the annealing process. In some of the best qualities of iron, after having been carefully annealed, there is scarcely any trace of residual magnetism, but as soon as it is worked upon in any manner, such as filing, hammering, or twisting its magnetic qualities are at once greatly impaired. In the iron parts of alternating current machines the iron gradually becomes hardened from the vibration of its molecules caused by the rapid reversals of polarity, and in time this effect becomes quite noticeable. This state of the iron is known as "Tired Iron" and there seems to be no means of overcoming it. Another peculiar after effect is that the strength of a magnet increases steadily for a while when a perfectly constant magnetizing force is applied. This may continue for quite a while and sometimes amounts to several per cent.

Having now considered the electro magnet in a general way we are ready to study the laws of the magnetic circuit which will be the subject of our next paper.

THE LONGEST ELECTRICAL POWER TRANSMISSION IN THE WORLD.

The most notable power transmission plant yet attempted, both from the point of view of amount of power and the distance of transmission, is already under way in the State of Utah.

The Pioneer Electric Power Company, of Ogden, Utah, has within the past month placed a contract with the General Electric Company for a complete 5,000 horse-power, three-phase plant, covering a transmission of thirty-six miles from Ogden to Salt Lake City.

The power will be obtained from the fall in the canon of the Ogden River, at a point almost within the limits of the city of Ogden. Across the head of the Ogden canon a dam is to be thrown, and an immense storage reservoir formed, which will cover some fifteen or twenty square miles of a valley in the mountains. From this dam to the power house is a distance of nearly six miles. The water will be carried through a six-foot pipe of wood for about five miles, while for the rest of the way it will pass through a six-foot pipe of riveted steel. These pipes are fitted at intervals with automatic relief and air valves to prevent the bursting or collapsing when the flow of water is varied by change of load. The effective head of water at the power house will vary from 400 to 450 feet, and the full capacity of the pipe line will be 10,000 horse-power.

Two duplicate receivers will be used, one at each side of the power house, so that either can be shut down without stopping the plant. To these pipes running to the water wheel nozzles will be connected. The speed of the wheels will be controlled by Knight governors, and the valves will be operated by hydraulic pistons, so that the generators may be stopped and started from the switchboard. The water from the wheels on each side of the power house will pass into a central tail race under the floor between the two lines of generators, and will be conveyed into canals for the irrigation of some 18,000 acres of land in the vicinity of Ogden, which will be reclaimed for farming purposes.

The electric plant at first will consist of five 1,000 horse-power twenty-four pole three-phase generators driven by Knight water wheels running at 300 revolutions per minute. The water wheels and fitting will be furnished by the Risdon Iron and Locomotive Works, of San Francisco. Water wheel and armature are mounted on the same shaft, and are supported by the same base frame and bearings. The periodicity of the current is sixty cycles per second, and the generators will be wound for 2,300 volts.

Two exciters, each of 100 kilowatt capacity, direct connected to their own water wheels, will be provided, either of which will suffice to excite the fields of all the generators in the completed station.

The current from the generators will be carried by lead covered cables laid in ducts between the generator fountains and the wall of the building to the generator switchboards at one end of the power house. The boards will be blue Vermont marble panels, and will be completely equipped with all the necessary controlling and regulating instruments and apparatus. Tachometers on the switchboard, operated by synchronous motors electrically connected to the generators will indicate the speed of the machines.

The step up transformers and the 2,000 and 15,000 volt feeder panels will be placed in a gallery erected over the generator switchboard. The transformers, nine in number, each of 250 kilowatt capacity, will raise the generator potential from 2,300 volts to 15,000 volts, at which pressure 2,000 horse-power will be transmitted to Salt Lake City. The local distribution of the balance at Ogden will be made at 2,300 volts.

The transmitted current will pass over six No. 1 wires strung on insulators of a special porcelain developed by the General Electric Company to withstand high potentials to nine 250 kilowatt step down transformers at Salt Lake City, which will deliver it at 2,300 volts for distribution.

The transmission line and transformers will be arranged to allow of the use of a potential of 25,000 volts. This will permit of the efficient transmission of current to the mining regions of Mercur and other camps thirty to thirty-five miles beyond Salt Lake City. All lines will be protected by the latest types of General Electric lighting arresters, which have proved so efficient in other transmissions.

To construct the iron and wooden pipe bringing the water to the wheels 100 horse-power in motors are set up in the shops of Rhodes Bros., in Ogden, supplying extra power for the work, which is one of the most extensive pipe line contracts ever undertaken—five miles of six-foot wooden stave pipe, and one mile of riveted steel pipe. Practically all the work will be done on the ground, the steel being received in flat sheets to be rolled, punched and rivetted in the shops, and the lumber for the wooden pipe in the rough to be milled, planed and put together on the spot.

Salt Lake City, with the completion of the Pioneer plant, will receive power from two of the most important electrical transmission installations ever undertaken. That transmitting the power from the Big Cottonwood canon has only recently been completed; that of the Pioneer Company will probably be inaugurated about the 1st of November of this year.

AMERICAN TELEPHONE PRACTICE.

History and Principles of the Magneto Telephone.—By Kempster B. Miller.

The history of the telephone from its inception to its present state of perfection, is interesting in the extreme, and affords a striking example of the fact that great inventions are almost invariably the result of long and careful study on the part of many workers, rather than the sudden inspiration of a single genius. It is of even greater interest from a scientific standpoint, for in no way can one obtain a better idea of the fundamental principles involved in telephony than by following their development, step by step, noting the contributions made by each of the many scientists and inventors whose names are closely connected with the art.

These steps were made in logical order, the knowledge contributed by each investigator making possible a deeper insight into the subject on the part of his successors. It is best, therefore, to follow this order in obtaining primary ideas of the subject.

The history of the knowledge of electromagnetism begins in 1819, and with this date very properly begins the history of the electric telephone. In this year Oersted, a professor in the University of Copenhagen, discovered that a magnetic needle tends to place itself at right angles to a wire carrying a current of electricity. He further developed the laws regarding the deflections corresponding to the directions of the current in the wire, and those corresponding to the positions of the wire with respect to the needle.

In the following year Arego and Davy discovered that if a current be caused to flow through an insulated wire wrapped about a rod of steel the latter would exhibit magnetic properties. It was Wm. Sturgeon, however, who, in 1825, made an electro-magnet as we know it today, and called it by that name. To Sturgeon, therefore, belongs the credit of one of the greatest discoveries in the history of science. Joseph Henry also made his classic experiments on the electro-magnet, and to him must be accredited a large amount of our knowledge regarding it. Henry showed how to build a magnet capable of being operated over a great length of wire, a most important step.

In 1831 Faraday and Henry, independently discovered the converse of these laws of electromagnetism—that if the intensity of a magnetic field enclosed by a conductor be in any wise changed, a current of electricity will flow only while such change is taking place, and its strength will depend directly on the rate of the change.

These two laws concerning the transformation of electric energy into magnetic, and its converse, the transformation of magnetic energy into electric, are certainly the most important in the whole realm of electrical science, as single or together they form the foundations not only of the telephone and telegraph, but of electric lighting, electric power transmission, and of every other achievement by which electricity has revolutionized the methods of life throughout the whole civilized world.

As these laws form the very root of all telephone practice, a few illustrations directly in line with the principles of the telephone will not be amiss, even though they are very generally understood; for they will give a clearer understanding of the developments made by subsequent inventors. If, as shown in Fig. 1, a coil of wire be wrapped around a rod (R) of iron or steel, and a battery (B) placed in circuit with the coil, the

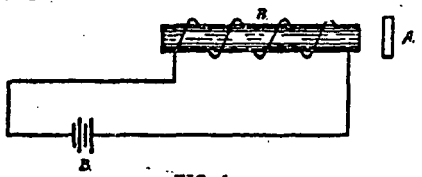

FIG. 1.

rod becomes a magnet upon the closure of this circuit, and will attract an iron armature (A) in the vicinity of either of its poles. Any variation in the strength of this current will cause corresponding variations in the attractive power of the magnet. If the rod be of steel, and permanently magnetized, it will exert an attractive force of its own on the armature, and the current will, according to its direction, increase or diminish this attractive force.

About every magnet there exists a field of force; that is, a region in which any body capable of being magnetized (such as iron) has exerted on it, by the magnet, an influence of attraction or repulsion. This field of force is usually graphically represented by closed curves, radiating from the poles of the magnet,

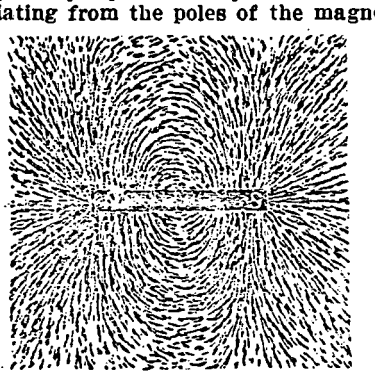

FIG. 2.

as shown in Fig. 2, and the strength of the magnet is commonly measured in terms of the number of such lines radiating from one of its poles. If now, a galvanometer, (G), or other current indicator (Fig. 3) be placed in circuit with a coil, (C), and a magnet, (N S), moved in the vicinity of the coil, or the coil in the vicinity of the magnet, in such a manner as to change the number of lines of force passing through the coil, a current is generated in the coil and is indicated by the galvanometer. This current will flow only while the magnet is being so moved. Its direction will depend on the direction of the lines of force threading the coil and on whether their number is being increased or di-

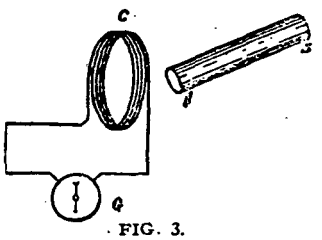

FIG. 3.

minished. Its strength will depend on the rate at which their number is changing.

If a mass of iron be brought within the field of a magnet, the field becomes distorted by virtue of a larger number of lines finding their path through the space occupied by the iron than through the same space when filled with air. Therefore, if a closed coil be placed about a pole of the magnet and a body of iron be moved to and from the pole, the intensity of the field in which the coil lies will vary, and currents of electricity will flow in the coil.

In 1837 Prof. Page of Salem, Mass., discovered that a rod of iron, suddenly magnetized or demagnetized would emit certain sounds due to a molecular rearrangement caused by the changing magnetic conditions. This phenomenon is known as "Page's effect."

Late in the Thirties, Prof. S. F. B. Morse placed at one end of a line Sturgeon's electro-magnet (M), (Fig. 4), with a pivoted armature (A), and at the other end a battery (B), and a key (K), for

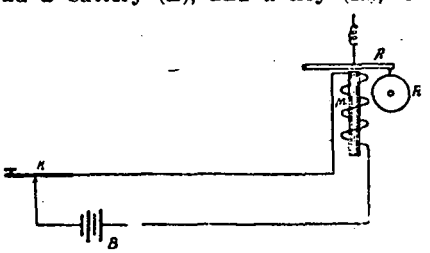

FIG. 4.

making and breaking the circuit. By manually closing and opening the key the core of the magnet became magnetized and demagnetized, thus alternately attracting and releasing the armature. By this means signals were sent and recorded on a strip of paper, carried on a roller, (R), in front of the armature, and thus for the first time intelligence was electrically conveyed between distant points.

In 1854 a Frenchman, Chas. Bourseul, predicted the transmission of speech, and outlined a method correct save in one particular, but for which error one following his directions could have produced a telephone of greater efficiency than that subsequently devised by Bell. His words at this date seem almost prophetic: "Suppose a man speaks near a movable disk sufficiently flexible to lose none of the vibrations of the voice, and that this disk alternately makes and breaks the current from a battery; you may have at a distance another disk which will simultaneously execute the same vibrations."

Philip Reis, a German inventor, constructed a telephone in 1861, following very closely the path outlined by Bourseul. He mounted a flexible diaphragm, (D),(Fig. 5), over an opening in a wooden box, and on the center of the diaphragm fastened a small piece of platinum (P). Near this he mounted a heavy brass spring, (S), with which the platinum alternately made and broke contact when the diaphragm was caused to vibrate. These contact points formed the terminals of a circuit containing a battery, (B), and the receiving instrument. His receiver assumed various forms, prominent among which was a knitting needle, (N), wrapped with silk insulated copper wire and mounted on a cigar box

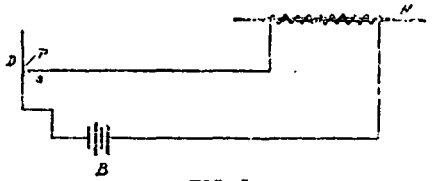

FIG. 5.

for a sounding board. Its operation was as follows: The sound waves set up by the voice struck against the diaphragm of the transmitter, causing it to vibrate in unison herewith. This made and broke the circuit at the contact points, and allowed intermittent currents to flow through the receiver. These currents, which exactly synchronized with the sound waves, caused a series of sounds in the knitting needle by virtue of "Page's effect." The sounding board vibrated in unison with the molecular vibrations of the needle, and the sound was thus greatly amplified.

Reis' telephone could be depended upon to transmit only musical sounds, but it is probable that it did actually transmit articulate speech. The cause of this partial failure will be understood from the following facts: A simple musical tone is caused by vibrations of very simple form, while sound waves produced by the voice are very complex in their nature. These two forms of waves are shown graphically in Fig. 6. Sound possesses three qualities: Pitch, depending entirely on the frequency of the vi-

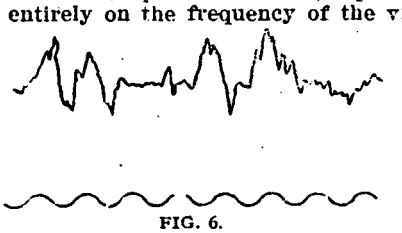

FIG. 6.

brations; loudness, depending on the amplitude of the vibrations, and timbre or quality, depending on the form of vibrations. The tones of a flute and a violin may be the same as to pitch and loudness and yet be radically different. This difference is in timbre or quality.

Reis' transmitter was able only to make and break the circuit, and a movement of the diaphragm barely sufficient to break the circuit produced the same effect as a much greater movement. The current therefore flowed with full strength until the circuit was broken, when it stopped entirely. The intermediate strengths needed for reproduc-

ing the delicate modulations of the voice were entirely wanting. This apparatus could, therefore, exactly reproduce the pitch of a sound, but not its timbre and relative loudness.

For the next fifteen years no great advance was made in the art of telephony, although many inventors gave it their careful attention.

In 1876, Prof. Alexander Graham Bell and Prof. Elisha Gray almost simultaneously invented successful speaking telephones. Although Bell has reaped the profit, the United States Patent Office having awarded priority of invention to him, an equal share of the honor is due to Gray.

Bell possessed a greater knowledge of acoustics than of electrical science, and it was probably this that led him to appreciate wherein others had failed. His instrument consisted of a permanent bar-magnet, (B) (Fig. 7), having on one end a coil of fine wire. In front of the pole carrying the coil a thin diaphragm, (D), of soft iron was so mounted as to allow its free vibration close to the pole. Two of these instruments are shown connected in a circuit in Fig. 7.

Two points will be noticed which have heretofore been absent: That no battery is used in the circuit, and that the transmitting and receiving instruments are exactly alike. When the soft iron diaphragm of the transmitting instrument is spoken to it vibrates in exact accordance with the sound waves striking against it. The movement of the diaphragm causes changes in the magnetic

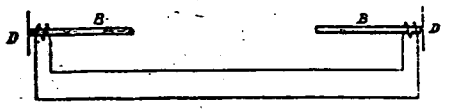

FIG. 7.

field in which lies the coil, which changes, as shown above, cause an alternating current to flow in the circuit. This current varies in unison with the movements of the diaphragm. The waves of this current are very complex, and represented graphically are similar to those of the voice shown in Fig 6. Passing along the line wire, these electrical impulses, so feeble that only the most delicate instruments can detect them, alternately increase and decrease the strength of the permanent magnet of the receiving instrument, and thereby cause it to exert a varying pull on its soft iron diaphragm, which, as a result, takes up the vibrations and reproduces the sound faithfully.

Bell's form of instrument, with a few minor changes, is the standard of today. It is now used as a receiver only, a more efficient transmitter, depending upon entirely different principles, having been invented.

In concluding this sketch Lord Kelvin's words seem appropriate: "Who can but admire the hardihood of invention which devised such very slight means to realize the mathematical conception that if electricity is to convey all the delicacies of quality which distinguish articulate speech, the strength of its current must vary continuously as nearly as may be in simple proportion to the velocity of a particle of air engaged in constituting the sound."—American Electrician.

ELECTROMOTIVE FORCE, COUNTER ELECTROMOTIVE FORCE AND SPEED.

The E. M. F. of a generator depends upon the number of wires on the armature, the strength of the field magnets and the speed. In any given machine the number of wires on the armature is, of course, fixed, and the E. M. F. can only be varied by varying the speed or the strength of the field magnets. Suppose a generator having separately excited and constant fields to be in motion with the outside circuit broken: An E. M. F. will be generated at the terminals depending upon the speed and the strength of the field magnets. No current will flow because of the circuit being open. The power consumed in generating a current is equal to the product of the number of volts of E. M. F. by the number of amperes of current; and since the amperes are here zero, the power consumed will be zero—that is, no power will be consumed by the generator other than that necessary to turn it in its bearings. Now let the circuit be completed with a large resistance: A small current will flow and a small amount of power will be consumed equal to the product of the number of volts by the number of amperes. Let the total resistance including that of the armature, be halved, and the amperes will be doubled and with them the power will be doubled, since the E. M. F. will remain unchanged or practically unchanged—we say practically unchanged, since in point of fact the E. M. F. will drop slightly at the terminals as the outside resistance is decreased. With the outside circuit broken, no current flows and the full E. M. F. due to the speed will appear at the terminals. When the outside circuit is completed, current flows, a part of the full E. M. F. will be used up in forcing this current through the armature wires, and a less E. M. F. will appear at the terminals. As the outside resistance is decreased and the current increased, the amount of the E. M. F. used up in the armature will increase with the current, and the amount of remaining E. M. F. will decrease. Since, however, under normal conditions, the resistance of the armature is always small in comparison with the outside resistance, the proportion of the E. M. F. used up in the armature will be small, and the E. M. F. appearing at the terminals will be nearly constant, regardless of the variation in the outside resistance within usual limits.

In all that has been said, it should be remembered that the fields are supposed to be supplied from an outside source, and so be of constant strength. In point of fact, when, as usual, dynamos magnetize their own fields, the winding can be so arranged that the fields will strengthen as the current increases, and so maintain or even increase the E. M. F. with an increase of current. The E. M. F. which appears with an open circuit is called the total E. M. F., and that which appears when the circuit is closed is called the effective E. M. F. When the E. M. F. of a generator is spoken of without qualification, it is the effective E. M. F. which is meant.

If the generator which has been considered have its speed changed, the E. M. F. will be changed in proportion; and as the amperes of current under a given resistance are proportional to the E. M. F., it follows that the current generated will likewise vary in proportion to the speed. It should be noted, however, that since the power is the product of the volts and amperes, the power will vary faster than the speed. If the volts and amperes are both doubled, the power will be quadrupled, and so for any change—in other words, the power varies as the square of the speed. This will show at once the great advantage of high speed in dynamos.

The generation of an E. M. F. is due to the motion of a conductor in the vicinity of a magnet in such a direction as to cut the lines of force. It matters not by what power this motion is produced. In a generator the power is mechanical power applied from without. In a motor the conditions are the same, except that the power is derived from the action of the magnets on a current supplied from without. This does not affect the generation of an E. M. F., which, precisely as in a generator, is produced by the motion of the armature coils in the magnetic field. It is a universal law of all electric action that the effect produced always opposes the force which produces it. In consequence of this law the E. M. F. produced in a motor acts to oppose the E. M. F. which drives the motor. Hence the E. M. F. of a motor is called the counter E. M. F. Its magnitude follows the same law as the E. M. F. of a generator, that is, it is proportional to the strength of the field magnets and to the speed. It follows at once that the higher the speed at which a given motor armature is allowed to run, the higher the counter E. M. F. will be, and, if the applied E. M. F. be constant, the smaller the current flowing through it. Could the speed be high enough, the counter E. M. F. would equal the applied E. M. F., and no current would flow. Under these circumstances the motor could develop no power, and hence such a speed is impossible in a motor. We see thus that the counter E. M. F. must be less than the applied E. M. F. Should, however, an engine be belted to the motor to assist it, and should the speed of the engine and motor be increased, the counter E. M. F. would rise until at a certain speed it would equal the applied E. M. F. At this point no current would flow through the motor armature, which would do no work, but its former work would be carried by the engine, and itself would simply turn idly in its bearings. Should the speed be increased still further, the E. M. F. of the motor would increase still further, when it would exceed the applied E. M. F., and the motor would become a generator driven by the engine.

The counter E. M. F. of a motor acting to oppose the current, it would be natural at first sight to look upon it as being of the same nature as the resistance of a wire. In point of fact, however, its effect is quite different. While the resistance of a wire opposes the current, it does not stop it. No matter what the resistance, current will flow through it—a large current if the resist-

ance be small, and a small current if the resistance be large. The effect of counter E. M. F., however, is to act to the extent of its amount as an absolute dam to the current. Thus, suppose the resistance of the armature to be 10 ohms, and the applied E. M. F. 100 volts: If the motor be held stationary, so that there be no counter E. M. F., the current will be $\frac{100}{10} = 10$ amperes. Now let the motor be released and allowed to turn at such a speed that a counter E. M. F. of 90 volts is developed: These 90 volts simply neutralize 90 of the applied volts, and leave remaining 10 effective volts to force current through the 10 ohms. Under these circumstances the current will be $\frac{10}{10} = 1$ ampere. A further consideration will show that while the current is exactly inversely proportional to the resistance, it is not inversely proportional to the counter E. M. F. Thus, suppose the applied E. M. F. to be 100 volts, the counter E. M. F. 99 volts, and the resistance of the wire 10 ohms: The effective E. M. F. is now 100—99=1 volt, and the current $\frac{1}{10}$ ampere. Now let the speed be reduced so as to reduce the counter E. M. F. to 98 volts: The effective E. M. F. becomes 100—98=2 volts, and the current $\frac{2}{10}$ amperes. In other words, reducing the counter E. M. F. a little more than one per cent has doubled the current. This principle is at the base of the operation of shunt-wound or constant speed motors, and is very important.

It should be noted here that the work done by the current is not that due to the effective voltage and the amperes. Take the case above of an applied E. M. F. of 100 volts, counter E. M. F. 98 volts, wire resistance 10 ohms, and consequently a current of $\frac{2}{10}$ ampere: It might at first sight be imagined that the power expended by the current would be $2 \times \frac{2}{10} = \frac{4}{10}$ volt ampere or $\frac{4}{10}$ watt, but this would be an error. The power expended by the current is that due to the full applied voltage multiplied by the amperes, namely—$100 \times \frac{2}{10} = \frac{200}{10} = 20$ watts. The $\frac{4}{10}$ watt is the power expended in overcoming the wire resistance; that is, it is the lost power, since its only effect is to heat the wire. The number of volts of counter E. M. F., multiplied by the amperes, namely, $98 \times \frac{2}{10} = \frac{196}{10} = 19\frac{6}{10}$, is the power realized by the armature, as has been said before, and we observe that $19\frac{6}{10} + \frac{4}{10} = 20$, as it should.

Next imagine a motor (still with its field magnets kept at constant strength by a current from without) to be at work under the constant applied E. M. F., and loaded with a friction brake: The speed is such that the counter E. M. F. allows a current to flow, whose power equals that absorbed by the brake. Let the pressure of the brake shoe on the brake drum be decreased: The amperes of current multiplied by the volts of counter E. M. F. is now in excess of the work to be done, and the speed increases. This increased speed develops more counter E. M. F., which checks the current, this process going on until the new counter E. M. F. multiplied by the new current equals the reduced power absorbed by the brake. We thus see that a decrease of load is accompanied by an increase of speed and a decrease of current. On the other hand, if the brake-shoe pressure be increased the speed will slow down, which, developing a smaller counter E. M. F., will allow more current to flow, until the product of the new counter E. M. F. by the new current equals the new load. As has been shown, the increase of current is much greater than the decrease of counter E. M. F.; and since the change in counter E. M. F. and speed go together, the change in speed will be or can be made comparatively small. This is effected by providing that in the first place the field strength shall be constant, and in the second place the wire resistance of the armature shall be small. The small resistance of the armature insures that the counter E. M. F. shall nearly equal the applied E. M. F. As has been shown, under these conditions the variation of current for different loads will then be obtained with a small variation in speed.

If the load on the brake be indefinitely increased, the current will continue to increase; and if the load be made too great, the resulting current will be more than the motor can carry, with a burned-out armature as a result.

It will be seen that so far as the armature alone is concerned, the counter E. M. F. depends on the speed alone; and the E. M. F. is often said to be a matter of speed only. This statement should, however, be qualified by prefixing "with a constant field."—American Machinist.

THE DE LAVAL STEAM TURBINE.

By E. H. Mullin.

No invention of recent years is so full of fascinating possibilities as that of the steam turbine. Everyone knows the revolution that the ordinary turbine made in the application of water power. Instead of utilizing merely the mass of water, as the old-fashioned overshot and undershot wheels did, the turbine received the pressure of the weight of a column of water from the level of the head of the reservoir to the depth below, at which it was operated. It is by means of turbines that a small portion of the enormous power of Niagara has been made available for the generation of electricity.

About a year ago the New York Edison Illuminating Company imported from France, at its own expense and risk, two De Laval steam turbines, with a capacity of 300 horse-power each. Attached to each of these were two 100 kilowatt Desrozier dynamos of the same pattern as that adopted by the French Government. Of course, as soon as the Edison Illuminating Company was satisfied that the steam turbines were successful, commercially and economically, it would substitute dynamos of its own make.

The De Laval steam turbine, as viewed from the outside, consists of two parts, cylindrical in form. The first of these cylinders, situated furthest from the dynamos, contains the exhaust box, the steam turbine wheel, the steam chest and the six nozzles by which the steam is directed on the wheel. The second cylinder contains the somewhat complicated gearing by which the revolutions of the turbine are reduced to the comparatively low speed necessary for the dynamos.

Fancy to yourself a small wheel thirty inches in diameter including several hundred cup-shaped discs, two-fifths of an inch in width, open at both sides and occupying some three inches of the rim. It is out of this little wheel, strongly built towards its center with layers of steel plates so as to form a blunt cone on each side, that 300 horse-power has to come. The steam is first admitted into the steam chest at an initial pressure of 120 pounds to the square inch. It is then fed to the turbine by six needle valves with adjustable handles on the outside. These valves are placed at equal distances around the turbine so that when one is opened on one side, the corresponding valve on the other side may also be opened to the same extent so as to balance the motion of the wheel as much as possible.

Below the needle point, which opens or closes each of these valves, the supply pipe gradually expands until it has an area six times as great, where it strikes the wheel, as its opening. Then it covers three of the cup-shaped discs at one time. Thus by a simple calculation, if the steam is at a pressure of 120 pounds to the square inch at its entrance into one of the needle valves, it is expanded until it occupies six times the space, when it would have a pressure of twenty pounds to the square inch. This is sufficient to give the turbine 9,000 revolutions a minute—a speed very far in excess of anything which could be attempted by a piston engine. It is well known that all piston engines have a limit of speed necessitated by the time required to allow the steam to clear out of the cylinder before a fresh supply is given for the next stroke. There is also a loss of power in piston engines by the conversion of the horizontal into circular motion, because the piston must come to rest at each end of the cylinder, though it be for only the infinitesimal part of a second. It has, therefore, long been the dream of inventors to make an engine by which the limit of speed would not be controlled by the time necessary for the clearance of the steam, and by which the "dead centers" of piston engines would be obviated. The steam turbine seems to fulfill both these conditions.

The steam, after passing through the cups of the turbine finds itself in the exhaust box. Attached to this box is a pump which maintains a vacuum of twenty-six inches and removes the steam to be condensed in the ordinary way. The turbine itself is fixed to a thin shaft of steel only an inch and one-tenth in diameter. Owing to a peculiarity of the De Laval steam turbine, room has to be left for the play of this shaft. This is accomplished by fitting the outer end of the shaft nicely, but not tightly, into a sleeve, the outer side of which is spherical in shape so as to be able to play in a seat of the same kind, something on the plan of a ball-bearing. The inner end of the shaft passes through ordinary bearings coated with babbit metal. It ends in a small toothed wheel, bevelled on both sides, which fits into four larger wheels, two on each side. These in turn are fitted to the shafts of the two armatures of the Desrozier dynamos. The larger wheels are twelve times the diameter of the small one on

the turbine shaft, so that the 9,000 revolutions per minute are reduced to 750 per minute—the normal speed of the dynamos.

The two turbines imported by the Edison Electric Illuminating Company were erected one in the power house in Thirty-ninth street, and the other in the power house in Twelfth street. They have been subjected to frequent tests during the year, though they have never been used continuously for any length of time. A six hours' test recently made, under ordinary operating conditions, showed that 692.48 amperes were generated at the positive dynamo at a pressure of 127.25 volts, while at the negative dynamo 709.18 amperes at a pressure of 128.28 volts were generated. This gives, by multiplying the volts and amperes on each side and adding the results together, an average of 179.077 watts. Assuming a dynamo efficiency of ninety per cent, gives us a total amount of work from the turbine equal equal to 198,975 watts, or dividing by 746, 266.72 ordinary horse-power. This was accomplished with a consumption of 17.348 pounds of water per brake horse-power per hour.

The apparatus which gave these results occupies very little space. Its total length is 159 inches, its breadth 77 inches, and its height 51 inches. It is thus very economical in regard to space. Steam turbines are used extensively in electric lighting plants in France and England. The De Laval type is the one common in France, while the Parsons type is generally used in England. The city of Portsmouth uses Parsons steam turbines exclusively for generating electricity, while the Metropolitan Electric Company of London, has several steam turbines in its extensive plant. The reason why this company introduced the steam turbine is curious, to say the least. It was found that the vibration in some of the power houses was so great, owing to the traffic in the adjoining streets, that the ordinary steam engines produced an unsteady current in the dynamos. The use of steam turbines was found to remedy this defect.

The wear and tear of the gearing of a machine making 9,000 revolutions a minute ought to prove, reasoning by analogy, one of the most serious defects of steam turbines. No matter what alloy or simple metal is used in the composition of the small wheel on the turbine shaft, it must sooner or later wear loose, thus materially interfering with the horse-power efficiency of the entire apparatus. There is another possible drawback to the steam turbine which would have to be determined by an actual test under ordinary operating conditions. The shaft of the turbine is only one and one-tenth of an inch in diameter. Suppose, as often happens, the current from the dynamo was short-circuited, what would happen to the shaft? The largest connecting rods in ordinary steam plants are but like reeds when short-circuiting occurs. Is there any reason for believing that the slender shaft of the turbine would not be shattered into a dozen pieces?

As regards the consumption of steam per horse-power hour, the steam turbine is more economical than a non-condensing engine, but less economical than a modern triple expansion engine of the best type. It must be remembered, however, that the steam turbine is a comparatively new invention, and that great improvements in it might be expected to arise from its general use.

THE ADVANTAGES OF THE MULTIPOLAR TYPE OF ELECTRIC MACHINERY.

By Wm. Baxter, Jr.

In the days previous to the advent of the dynamo, it was customary to construct electric machines with many poles, but when the modern development of the electrical industry began it was found that two-pole machines could be made that would generate just as powerful currents as those of the multipolar type. As it is the natural tendency of machinery builders to favor simplicity, the less complicated bipolar machines became the favorite. After awhile the more far-sighted among electrical engineers began to see that an increase in the number of poles would be advantageous, notwithstanding the apparently greater complication. From that time onward the latter style of construction began to grow in popularity, and to-day is used almost exclusively for large machines, and to a very considerable extent even in the smaller sizes.

The advantages of the multipolar type are quite numerous, and so clearly defined that they can be easily pointed out; the disadvantages are very few, and of such a doubtful character that it is a debatable question whether they are disadvantages or not.

Most of the points of superiority of this class of machines are due to the fact that, under the same conditions, the output per pound of weight of machine can be made much greater than with the two-pole type. This advantage of an increased capacity per unit of weight can be utilized in several ways; thus, it becomes possible to improve upon the results obtained with the bipolar construction in any direction in which a gain may be desired.

Every engineer will admit that if more work can be obtained from a given weight of machine, running at the same velocity, by a simple change in the design, this change is desirable and valuable; but there are many, even among electrical engineers, who cannot fully comprehend why the mere increase in the number of poles should render such results possible, and a few others are even disposed to assert that they are not possible. In the following it is proposed to show clearly why an increase in the number of poles will cause an increased output per unit of weight. This fact being established, it will be a simple matter to show how the gain can be utilized either to reduce the size, the weight or the velocity of a machine:

The output of an electrical machine is proportional to the strength of the magnetic field multiplied by the number of wires on the armature, and the velocity of the latter. To make a comparison between machines with a different number of poles, the velocity must be assumed to be the same in all cases. The strength of the field will be proportional to the cross-sectional area; therefore, one pole with a cross-section of 100 square inches will be equal to two poles of 50 square inches each, or four poles of 25 square inches each. The above statement will be true if the magnetic density per square inch is the same in each case, and that is the condition here assumed. The number of turns of wire that must be wound on the magnets to give this density will be proportional to the magnetic resistance of the magnetic circuit.

Let Figs. 1, 2 and 3 represent three dynamos—one with two, one with four, and one with eight poles. The outside

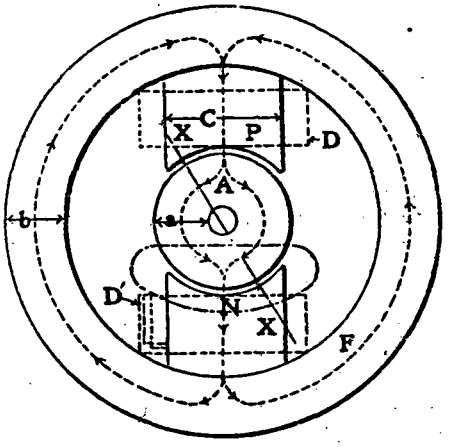

Fig. 1

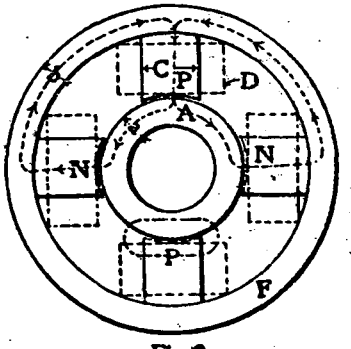

Fig. 2

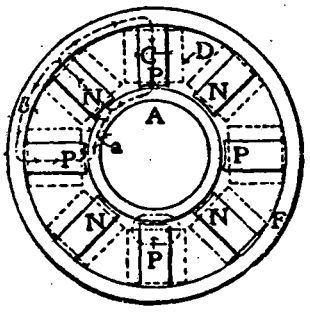

Fig. 3

diameter of the armature is the same in the three cases; therefore, the number of turns of wire upon it will be the same. The length of the armature, as well as the width of the field, is assumed to be the same in all cases.

In Fig. 1 the total magnetism of the field passes from the pole P, through the armature, to the pole N, and back through the field ring to P, as shown by the dotted lines.

In Fig. 2, there are two P poles and two N poles; therefore, if half as much

magnetism passes through each set, the total amount passing through the armature will be the same as in Fig. 1. But if only half as much passes through each path, the cross section will have to be half as much; that is, C in Fig. 1 will be twice as great as C in Fig. 2. In Fig. 1 it will be noticed that a and b are equal and only half as great as C. This is because C carries all the magnetism, while a and b only carry one-half. For the same reason, in Fig. 2, a and b are one-half as great as C. Therefore, a and b, in Fig. 1 are twice as wide as in Fig. 2.

In Fig. 3 there are four P and four N poles; hence, the amount of magnetism circulating in each set will be one-quarter as much as in Fig. 1, and C, a and b will be one-quarter as wide as in Fig. 1.

A little reflection will show that these three machines will be of equal capacity if magnetized to the same density per square inch, because the effect of the two P poles in Fig. 2, and of the four P poles in Fig. 3, is the same as the one P pole in Fig. 1. As the armatures in each case are the same size and have the same number of turns of wire, the output of the three machines must be equal. But a glance at the three figures will show at once that there is a great difference in the amount of iron, both in the field and the armature, and also a considerable difference in the size of the machines. In order to demonstrate fully that the three machines are of the same capacity, it remains to be proved that the magnetic density per square inch is the same in each case.

As has already been stated, the number of turns of wire that must be wound upon the field to obtain a given density will be proportional to the magnetic resistance or "reluctance," as it is called, of the magnetic circuit. This resistance is composed of two parts—that of the air space between the armature and the poles of the field, and that of the iron in the field and armature through which the magnetism passes. The resistance of the air space will be the same in each case, but that of the iron will be proportional to the length of the dotted lines which indicate the path of the magnetic circuit. As will be noticed, these lines are much longer in Fig. 1 than in Fig. 2, and longer in the latter than in Fig. 3. The difference will be found to be very nearly in the proportion of 1, 2, 4. The number of turns of wire that must be wound upon the magnets in each case, to obtain the same density, will be in the ratio of 1, 2, 4 for the resistance of the iron, plus the same amount in each case to overcome the resistance of the air space, or "air gap," as it is called by electrical engineers. If the resistance of air and iron were equal, or anywhere near equal, the number of turns of wire on the magnets of the thin machines would be nearly in the proportion of 1, 2, 4; but the resistance of the air for the same length and area is several hundred times greater than that of iron. Therefore, in Fig. 1 about one-half the wire wound on the field would be required to overcome the resistance of the short air gap. From this we can see that the number of turns of wire wound on the magnets of each machine would be about as follows: For No.1 machine, 1 part for air gap and 1 part for iron circuit, total 2; for No. 2 machine, 1 part for air gap and ½ part for iron, total 1½; for No. 3 machine, 1 part for air gap and ¼ part for iron, total 1¼; or in the proportion of 1 for No. 1, ¾ for No. 2, and ⅝ for No. 3. The cross-section of the wire in the spools D in the three machines is drawn in about this proportion, as will be seen at D¹, Fig. 1, where the sections of the three coils are superimposed to facilitate comparison.

(To be continued.)

PRESENT AND PROSPECTIVE WORK.

Sedalia, Mo.—An electric road is projected between this city and Monett, Lawrence Co., Mo. The enterprise is said to be backed by Boston and New York capitalists.

Penn Yan, N. Y.—A new telephone line is being constructed between this place and Watkins. It is to be a copper line and will be used chiefly for long-distance telephoning.

Grand Rapids, Mich.—The Furniture City Electric Co. has secured the contract for wiring the Clark Block, one of the largest in the city. The building when finished will be the home of the Elks, National Guards and other societies. Over 2,000 lights will be used.

Fort Dodge, Io.—Work has begun on electric street car lines in this city.

Schenectady, N. Y.—It is reported that the General Electric Co. contemplates the erection of two new buildings and that some of the business now carried on at Lynn, Mass., will be transferred to this city on completion of the new improvements.

Springfield, Vt.—Work on the electric road between this city and Charlestown, N. H., has been resumed, and the contractors say that cars will be running in three weeks.

New Orleans, La.—The Edison Electric Light Co. will build a three-story plant, the contract for the work having been let to Jas. Stewart & Co. of St. Louis.

St. Louis, Mo.—The Board of Public Improvements has advertised for bids for lighting the city for a period of twenty years. The proposal calls for 25,000 thirty-two candle-power incandescent lights. This is a new departure and if carried out St. Louis will be the first large city to adopt incandescent lights exclusively for street lighting. All the city daily papers are against the incandescent scheme.

Tacoma, Wash.—The Metropolitan Telephone and Messenger Company has been organized in this city to do a general messenger and telephone business.

Susquehanna, Pa.—The Postal Tel. Co. is at work and ready to connect this place with Montrose, Great Bend, Hallstead and New Milford with the system at once.

A NEW TELEGRAPH COMPANY.

The preliminary move of the Postal Telegraph-Cable Company to gain a foothold in Texas resulted in the recent organization of a concern known as the Postal Telegraph-Cable Company, of Texas. This company was formed to construct telegraph lines to all the principal points in the State and make connections with the lines of the main postal company at several border points.

The president of this new company is Judge J. H. McLeary, of San Antonio, Tex., formerly Attorney General of the State. The parent company owns a controlling interest in the stock and the balance has been subscribed by residents of Texas and other portions of the Southwest. Active work on these new lines was begun recently.

The Fifteenth Annual Convention of the American Street Railway Association was held in St. Louis October 20 to 23, nearly all the street railways in the United States being represented, and among the delegates we noticed our friend, Mr. Wyman, of Milwaukee. The St. Louis meeting was the largest and most successful ever held by the association. The convention was held in the Auditorium Building, one corner being partitioned off for business sessions, and the balance of the space used by the different manufacturing and supply companies for exhibiting the latest devices in electrical equipments.

On November 10th the seventeen-year contract between the Western Union Telegraph Co. and the American Bell Telephone Co. expired. The telephone company has paid the telegraph company a royalty of 20 per cent on its net receipts in consideration of the surrender by the Western Union of the Edison transmitter patent. The Bell Company has paid the Western Union millions of dollars during the life of the contract, but it is not known what, if any, arrangements have been made for the future, and the world is waiting patiently to see whether it will be war or peace between the two great monopolies.

Arguments in the suit of the United States against the American Bell Telephone Co. commenced before the Supreme Court on November 9th, and will probably last several days. A decision is looked for before the holiday recess. The suit was begun February 9, 1893, when the Attorney General filed a bill in equity against the American Bell Telephone Co. and Emil Berliner, asking for the annullment of the patent. An alternative prayer was made that if the patent was declared wholly null and void it would be repealed in part, as the court deemed proper. The Berliner application for patent was filed June 4, 1887, but the patent was not issued until fourteen years thereafter. The main points raised by the United States are: First—That the patent is void for illegal delay in its issue. Second—That it is also void on the ground that a prior patent was granted upon the same application to the same applicant for the same invention. The patent covers what is known as the microphone transmitter.

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St. Louis, Mo., November, 1896.

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ALLIED PRINTING TRADES UNION COUNCIL ST. LOUIS

17

Our Unions should map out an interesting programme for the long winter evenings, and make the Union a social as well as business affair. Our members, particularly in large cities, are not well enough acquainted with each other and consequently there does not exist that friendly feeling and interest in each other's welfare which should exist among Electrical Workers. If our larger Unions had permanent headquarters or reading-rooms where the members could spend their leisure moments and by rubbing against each other and becoming better acquainted take more interest in each other's welfare, a fraternal feeling would spring up, that does not now exist. The Union should also arrange for a course of lectures as there is generally sufficient local talent to make an interesting course. Also by giving smokers, or other entertainments and inviting those who are not yet members, it will not be long when they will see that it is to their interest to belong to an organization that thus provides for the social, benevolent and business interests of its members.

The battle of ballots is over and trade is slowly returning to the channels from which by intent or otherwise it was diverted months ago. Since the election the press associations have been busy circulating news of business revival. While we can stand, and are grateful to the powers that be for giving us an opportunity to work, we should not be thrown off our guard and discard our shield and helmet. If there ever was a time when we should stand by our Unions and build them up, it is the present. The political policy of this country has been decided for four years, and although the victors worked day and night to prevent the poor laborer from committing political suicide, yet we can reasonably expect that their interest in the American laborer ceased on the 3rd of November. Up to that date with them it was politics. It is now business, and we are very much mistaken if an attempt will not be made to break up labor organizations, so that four years hence it will not be necessary for the Wall street philanthropist to stay up all night looking after the interest of the workingmen. During the prosperity which always follows a presidential election (it even followed the election of Grover Cleveland), we should do our utmost to strengthen our Unions and enlarge our treasuries and be prepared to present such a strong front that even Mark Hanna will throw up his hands.

The Board of Public Improvements of the city of St. Louis propose to make a new departure in street lighting, and has called for bids for lighting the streets and alleys for twenty years from January 1, 1900, with incandescent lights. The specifications state that about 25,000 thirty-two candle-power incandescent lights will be required. We know of no large city that has adopted incandescent lighting for its streets, and as the city of St. Louis seems to have made a bad blunder in its conduit bill, it should be very careful or it will make a worse blunder in lighting the city.

If the incandescent lights proposed to be used are no better than the alley lights at present in use in St. Louis, they will be no improvement over the gas lights of former days. While electric lighting is not in its infancy, improvements are constantly being made both in electric and other methods of illumination and no city should make a contract binding it to a certain light for twenty-three years from the date of contract.

The efficiency of the incandescent light is very low, being only about one-fifth that of the arc light, so that it will necessarily cost a great deal more to light the city properly with incandescent lights than it would with arc lights. Aside from the objections that can be urged against the change from arc to incandescent, there is serious objections to letting a contract for so long a time. The cost of producing electricity may be greatly cheapened long before the expiration of the contract, and yet the city would receive no benefit. Also, as the city of St. Louis owns an efficient waterworks, why not own its own lighting plant? It is only reasonable to presume that the city can in twenty years save enough by operating its own plant to pay for the original cost of the plant, and by issuing bonds for this purpose there need be no additional tax on the taxpayers. Chicago has done its own lighting for years, and although its plants may not have been run as economically as they should be, the city has had cheaper and better lighting than it probably would have had had the lighting been done by private contract.

Detroit has been operating its own plant now for over a year and is furnishing much better service at less expense than when the lighting was done by private contract.

If the general government can operate an efficient postal service, and if our cities can operate extensive waterworks and other institutions, there is no reason why they should not also operate their own lighting plants.

The Sixteenth Annual Convention of the American Federation of Labor will convene in Odd Fellows' Temple, corner Seventh and Elm street, Cincinnati, O., on Monday, December 14, 1896. In the call for the convention the executive council says:

"In issuing this call to our affiliated Unions, we are prompted to call attention to the emergency and necessity of full and complete representation by all who are entitled thereto. As we often justly complain of the lack of interest manifested by some of our members in our local bodies, their failure to attend the meetings, their failure to share the burdens and responsibilities of the legislation of our movement, and their consequent indifference thereafter, and possibly their antagonism, so with a number of Unions affiliated, they fail to send delegates and then possibly complain at the legislation. They are unwilling to bear part of the burden of expense incurred in sending a delegate, and consequently desire immunity from the responsibility of the legislation of the delegates to the conventions chosen by their respective Unions.

"We entertain the earnest hope that the Cincinnati convention will prove a new departure and that all Unions which can bear the financial burden or can make even the temporary sacrifice, will be represented. Certainly the conditions of the wage-earners of our country are such as should prompt us to devise the best ways and means by which they may become the larger sharers in the product of their labor. Surely the progress made along the lines of economic and social reform is not such as to lull ourselves or our fellow-workers into fancied security of industrial elysium."

We often meet the man who is just as good a Union man as ever lived. He repeats the numberless battles he has fought for the Union and the heroic sacrifices he has made. He deplores the many changes that have been made and tells us what he would do to rectify them. When asked to show his card: Oh, he has left that in some branch two or three years ago, and as it is so long ago he has forgotten where. Such men make us tired. The Union cannot be run on wind.—Quarrymen's Journal.

In a recent circular the National Union of United Brewery Workmen calls attention to the fact that the Union label of their organization has been indorsed by the Executive Board of the American Federation of Labor, and ask Union men to insist that the label is on all kegs and cases of beer, and patronize only such dealers as handle Union goods.

AN ADDRESS.

J. W. SULLIVAN.

(Fraternal Delegate from the American Federation of Labor, delivered before the British Trade Union Congress, in Edinburg, September, 1896.)

Fellow Trade Unionists: I have thought that I can best employ the time allotted to me here to-day in giving you some idea of how the organized wage-workers of the United States succeed in having laws passed for their benefit, and how they defend themselves against laws designed to oppress them.

In the work of obtaining legislation, the labor organizations are practically united; or, rather, they are rarely in antagonism. The national labor organizations are: First—The American Federation of Labor, which includes most of the national trade organizations, and comprises about 60 per cent of the labor which is organized. Second—The five orders in the railway service, namely, the Brotherhood of Locomotive Engineers, of firemen, of conductors, of trainmen, and of telegraphers, all of which federate on occasions, after a vote of the membership. The numerical force of the organized railway men may be inferred from the statement in the last report of the grand chief of the engineers that his brotherhood alone had 33,000 members. Third—The American Railway Union, organized three years ago, with the object of consolidating all railway workers without distinction. Fourth—The Knights of Labor. Outside these groups are many local unions, such as the building trades.

Annual state and national conventions of the national bodies, as well as of the trades separately, are held for the purpose of advancing organization, considering grievances of members or of the associated bodies, and discussing conditions, propaganda and legislation. For the last named object, committees, either special or permanent, are selected to wait upon the law-making bodies—Congress, the State legislatures or the city Councils—and demand law for the laborer. In this way, mainly, has all legislation for the American wage-earner been obtained.

On this subject I said a year ago, in welcoming the delegates of the American Federation of Labor to New York: "All non-union men are social ciphers. On the labor market they possess no freedom of contract; in politics they have no organization to protest against social wrongs. No force or non-union artisans ever faced their employer with a demand backed by power; no non-unionist ever helped to raise their shopmates' pay; no non-unionist ever assisted in fixing a wage scale; no non-unionist ever maintained a workingman's newspaper; no non-unionist ever checked a rapacious employer; no non-unionist ever put a fellow-workman into a political office; no non-unionist ever sent up a committee to a Legislature. But for the trade unions there would be no eight-hour law, no arbitration boards, labor bureaus or factory inspectors; no widespread discussion of radical political reforms; no instruction of the multitude in their rights; no 'social question;' no legislators fearing militant labor, and no laws on the statute books recognizing labor's interest as interpreted by labor. We are protectors to the helpless non-unionists."

All this is true. The trade unions, through constant agitation and persistently worrying legislators, have placed on the statute books nearly all the law that exists favorable to wage-workers. Mr. Bascom, president of an American college, has recently said: "In the absence of their organization, the wrongs and distresses of the laborers are simply forgotten by the community." Our labor laws date from a period, not so long ago, when it was deemed no more necessary to legislate as to the conditions than as to the wages of the workers—a time when there was no obstruction to any form of competition in labor, whether of women or of children; when for two laborers to combine in a demand was a conspiracy; when public opinion was strongly opposed to trade unions.

What advance has been made since that day may be seen from a brief review of the labor laws as they now stand.

By a Federal law, eight hours constitute a day's work for all laborers, workmen and mechanics who may be employed by or on behalf of the United States Government. In many of the forty-five States there is a similar eight-hour law for employes of the State; in some States contractors on State work are required to observe the eight-hour day; in many States steam railway and steet railway men have a legal ten-hour day; in numerous municipalities and townships the day is eight or nine hours on all public work; six State have provided that in the absence of any express agreement, eight hours shall be the day, and five States make it ten hours. In the case of women and children, nearly all the States regulate the hours of labor in manufacturing occupations, but not in domestic and agricultural, the legal day usually being ten hours. Protected by the legal short-hour day, then, are Government employes, the employes of contractors on public works, and women ond children. Beyond this, it has not been possible to advance the line. The Legislature of Nebraska did, indeed, attempt in 1891 to establish a general eight-hour law, except for farm and domestic labor. But the Supreme Court of that State declared the statute to be unconstitutional, and limiting the work day of adult male labor by law, except in the cases noted, thus stands checked.

The wages of Government employes are, of course, fixed by law. United States letter carriers receive from $600 to $1,000 per annum, according to locality and length of service; New York City street cleaners, of whom there are several thousand, $60 per month; New York policemen (not under the eight-hour law), $1,000 to $1,200 a year; compositors in the Government printing office in Washington $19.24 per week; unskilled laborers in the towns and cities of New England, $2 a day. In Detroit, Aldermen were recently voted $600 annually, that workingmen might hold the office. These figures indicate the general level of pay for Government employes. That level, serving as a standard to be striven for by other workingmen, is insisted upon by the unions.

The railway men have obtained a long list of statutes for their protection. Among these are laws providing for safety couplers, for bridge guards, for limiting the hours of continuous labor, for (in a few States) seats for horse car drivers; laws increasing the liability of railroad companies for the death or injury of employes, and for wages due from contractors and predecessors; laws prohibiting forced contributions, and Sunday labor under certain conditions, etc.

The mine laws differ in the various States, but in the most important mining districts they provide for inspection, for safety apparatus and for hospitals. They commonly prohibit payment in company scrip or in truck store orders, regulate methods in weighing coal, and forbid the employment of women and children in underground work. Where the unions are strong, the mine laws are stringent and well enforced; where the unions are weak, the laws are few and loose.

The factory laws of the United States have generally followed the precedent of the English factory acts of 1831, the right of the State in the premises resting on police power. The most important are: Statutes providing for the health of employes in factories by the removal of excessive dust, or for securing pure air, or requiring fans or other special devices to remove noxious dust or vapors peculiar to the trade; statutes requiring guards to be placed about dangerous machinery, belting, elevators, wells and air-shafts; statutes providing for fire escapes and adequate staircases with rails, rubber treads, and for doors opening outward; statutes providing against injury to operatives by the machinery used, and against overcrowding in factories. The health laws for factories are many, and are more or less adequately enforced through inspectors. Stimson, from whom I cite this list of factory laws, says that factory regulations and their enforcement "can only be attained by combination among the workmen themselves."

The American labor organizations have fought a long and hard fight to regulate the employment of children, women and convicts. To-day, in New York and Illinois, no child under fourteen years of age may work in a factory; in Massachusetts the lowest age is thirteen; in other New England States it is twelve to fourteen. The States mentioned stand first in manufactures. Children may not, in several States, work at occupations that are dangerous or unwholesome, or that might lead to moral injury. Female employes are protected in practically all the States by provisions for health and decency. They must have their own toilet rooms, with screened doors; they must be provided with seats where practicable; they are not permitted to undertake certain dangerous work. Convict labor, which has been a serious injury to free labor, has of recent years been forbidden or regulated in many States. In the South, where it is customary to hire out gangs of convicts to private employers, even for railway construction, such practices are nearly at an end. The furtherest advance in the suppression of convict competition with free labor has been in New York. A new clause in the Con-

stitution of the State, adopted by popular vote last year, provides that after January 1, 1897, no prisoner shall be allowed to work at any trade or occupation wherein the product or profit of his work is farmed out, contracted or sold to any person or corporation, except to the State itself, or one of its sub-divisions—that is, convict labor shall not put into the market goods that shall bring down the price of free labor.

Other important laws in force, in one group or another of the States, mainly through the exertions of the labor unions, are: Legalizing the union label and recognizing it as a trade-mark; excluding Chinese immigration wholly; limiting immigration in general; prohibiting the importation of aliens under contract; forbidding the discharge for membership in a trade union; permitting a laborer to break a contract; prohibiting the employment by corporations of private armed detectives in cases of strike; establishing Labor Day and a Saturday half-holiday in certain months; preventing compulsory labor on election days; fixing the time for the payment of wages—weekly, fortnightly or monthly, and giving wages priority in attachments and assignments.. Ohio and New York have set up free employment bureaus. In educational matters, the unions have called in the assistance of the State. In many States, besides fixing the lowest age at which a child may work in a factory, the law provides that up to a certain age he shall attend school a part of the year before going to work. In New York, the State has for several years provided free lectures for the working people in the public schools and halls during the winter. These have been successful beyond expectation—are attended, in fact, by tens of thousands weekly. In 1886 the labor unions of New Jersey had an act drawn up permitting any city of the State to tax itself to establish a free public library upon a certain percentage of the citizens petitioning for it and a majority of votes being cast at the polls for the projcet. Since then the larger cities have taken advantage of the law and established excellent libraries in handsome buildings, which are frequented mostly by the working classes. The free public library, as an institution has become a feature in the towns and cities of the United States within the last decade or two. In this respect, Massachusetts leads. There are free public libraries in all of the thirty cities of that great State, and in 260 of its 310 towns. Everywhere the labor unions help to promote the establishment of these libraries.

While carrying out the labor laws devolves largely upon the police authorities—Federal, State and municipal—the cause of the wage-earner is greatly assisted by the labor bureaus. These are the bureaus of labor and statistics, the State factory inspectors, the State arbitration boards and the commissions of immigration. Thirty-one of the forty-five States now have bureaus of labor statistics, while many States have the other bureaus mentioned, the offices commonly being in the State capitals. Nearly all have come into being during the past twenty years, or, in other words, with the growth of the labor movement. The National Department of Labor was established in Washington in 1885, and is doing much efficient work. In all these labor bureaus, union men have most of the places. The salaries usually range from $1,000 a year for the lower grade of clerkships and inspectorships to $3,000 or more for the commissioners.

At the present time several of the unions are demanding that the State shall give them better conditions in their special trades. The sailors, the bakers and the tailors are obtaining laws in their favor. The fleecing of the sailor is doomed, the unwholesome underground bakeshop is doomed, the sweatshop is doomed, if the men of these trades will only continue their struggles with the success they have had in the last three years.

A few words, before I close, on the attitude of the American courts toward union men. Twenty years ago the courts were sentencing men for conspiracy under laws that have since lost much of their severity, except only in a few States. In most respects our combinations are no longer unlawful; ordinary strikers are not conspirators. If the courts are now condemning boycotters, they are also giving attention to employers guilty of blacklisting, in regard to which the unions have obtained statutes. The injunctions by courts of equity against strikers, have, with few exceptions, affected only railway men, and have been issued under the interstate commerce act and anti-trust act, the objectionable sections of which are subject to repeal. While it has been said that, considering the hostility of the bench toward the trade unions, the speediest way for a man to put himself in jail is to join a trade union, the fact is that, though strikes are many, the strikers in jail are few. Courts may be circumvented, like many another human institution. From the moment when a striker disobeys judge-made law to the moment he should disappear behind the prison door, there are numerous legal loopholes to permit escape. If his union is strong in votes and money, if he is released on bail, if his trial is postponed indefinitely, if his misdemeanor is subject to a fine only, or if the pardoning power is lenient, the disobedient agitator may rest happy.

Finally, a few general observations. Organized labor in the United States has obtained law in its favor exactly in the measure of its power, its education as to its wants, and its ability to formulate its demands; when lacking aggressiveness, when uncertain of its immediate needs, when content with forming utopian platforms, it puts no law on the statute books. Organized labor increases wages in the United States by at least $200,000,000 annually. No other institution for improving labor's condition has ever done that. Organized labor uplifts all labor; the union man is protector to the non-unionist, in fixing the standard of wages and giving him better conditions. Organized labor is learning that legislators and judges are made and unmade by votes; it believes that if a right is worth having it is worth fighting for. Moreover, organized labor knows where it is; it is fully aware that only through gradual changes, each step well calculated and well taken, can the present immoral social system be overturned and universal justice made to reign.

FROM OUR UNIONS.

UNION NO. 2, MILWAUKEE, WIS.

In case our Press Secretary does not write, I will give you a few lines for No. 2, as we have been forgotten the last few months in "The Worker." No. 2 is getting along very nicely again. The hard feeling among some of our members on account of the strike has been worn out, and we are pulling the rope one way again. All the boys from the Pabst power plant have joined No. 2, and you bet we have a nice lot of members again. With the aid of the Building Trades Council we are getting our line repaired in good shape, as it has been in poor condition for some time. Our meetings are well attended, and we have some very good speeches at them, even on the strike of May, which was a failure, but sympathy strikes never seem to amount to anything anyhow.

Andrae is wiring the Germania Building, one of the largest buildings erected in this city, and has some of our old members working for him. Rohan & Meyer are wiring the new Uehlein Theater, and have Union men on the building. Keelyn & Smith are working all around the town, and have all Union men working for them. So you will see Milwaukee is getting to have more Union electrical workers than it had before the strike.

We are trying to get all the electrical workers into No. 2, and if we do, and we have the best of hopes of getting them, you will see No. 2 to the lead of Electrical Workers in a short time.

Petermann & Wallber are also doing a nice line of electrical work, and have several of our members working for them, so you see our boys are in all departments of the city, and all are trying to get new members, which makes No 2 grow very nicely.

In closing, I will say that I am not very far from right when I say our Local is for free silver and Bryan, and can any one tell us why we should not be?

GEO. POEHLMAN, Fin. Sec'y.

UNION NO. 6, SAN FRANCISCO, CAL.

Local No. 6 is again before you. We wish to impress upon your mind that we are working heart and soul for the welfare of Local No. 6, the Worker, and the National Brotherhood.

Organization has its ups and downs as all of us know who are members of such. But Local No. 6 for the number of members it has in good standing, and nearly all are in good standing, has a treasury account which almost any local of its age can be proud of. It shows without argument that the boys from the foggy shore of the Pacific are working to a unit for its welfare. We will in the near future, have a lodge room of our own, and a well-stocked library where our members can spend their evenings either in discussing subjects which relate to their respective departments, or anything that amuses or creates harmony. It is, we believe, asserted that those who follow our vocation create dissension among themselves and there is no such a thing as unity or harmony. We assert this is false. We believe that in an order like ours who

its members associate with one another continually, prosperity is sure to follow.

Local No. 6 in behalf of its champion climbers wishes to know what rules governed the pole climbing contest of No. 73. The Local had the same rules governing at the foot of the pole, but five feet from the top of the pole was a cross arm and the contestant was required to place both feet on the arm before descending. Our line climbing contest was 30-foot poles, three in number, 75 feet apart. This was won by Bro. J. J. Cameron in thirty seconds.

Bro. Walter Bentley met with what might have been a serious accident. He and his partner, Desmond, were placing a lamp in front of a store on Sixth street, connecting it with a night circuit. Everything was finished, but before leaving he discovered the lamp was not quite straight, and went up the ladder to straighten it. The lamp being high and the ladder short he had to stand on the top step of the ladder. There as a gas jet close by which he grasped with one hand to steady himself and took hold of the lamp with the other. In a moment he was in a vice-like grip which drew him up, but he had presence of mind to kick the ladder away from underneath and his own weight broke his hold. He was unconscious, but the contact with the sidewalk brought him back to stern reality. His hands were quite badly burned in places, but he is getting around all right.

Bro. Gus Erickson is on the sick list, having contracted malaria fever up at Sacramento. It was a close call for Gus, but he is recovering slowly.

J. J. Cameron the other evening met with an accident at his brother's house. He slipped on the floor and dislocated his knee-cap.

Well, brothers, when you see these lines in the Worker, we will have passed the Presidential election, one of the hottest since Abraham Lincoln, and we prophesy that the American voter will use the same judgment now as they did then, because the country demands it. I am no predictor of what the result will be, but I believe that the election of 1896 should go as it did then—Republican.

A. C. JOHNSON, Press. Sec'y.

UNION NO. 9, CHICAGO, ILL.

The Press Secretary not having had time to write to the Worker for the last three months, a report of our picnic, which occurred on August 30, at Gardener Park, has not been sent in. The picnic was a financial success, but it cost an immense amount of labor to accomplish this under a gold standard. We cleared about $250.00. Great credit is due to every member of No. 9 for the interest taken in this grand affair. The crowd numbered about 3,600 people, and all agree that they had a nice time, and seemed perfectly satisfied. The games and contests came off without an accident. The pole climbing contest was the main feature of the day, for which there were eleven contestants. The pole was a beauty, 83 feet long, spliced in such a manner that the splice could scarcely be seen. There was not a piece of iron in it. It was dovetailed together and wooden pins used. Bros. Bogan and W. E. Knapp were the artists. The contestant had to climb 65 feet in the clear. A man by the name of R. Shaw won the first prize by accidentally slipping about 18 feet. Time, 34 seconds. He does not belong to the Brotherhood. The best climb was made by Bro. C. Paulson of No. 2 Milwaukee, but he lost on a foul, as he did not step under the line six feet from the ground. His time was 32 seconds.

Second prize was won by Bro. W. F. Cooney, time, 23 1-2 seconds.

Bro. J. Poling won the rope throwing contest over a wire 55 feet high. He had 14 feet of line on the ground. Bro. Nelson won second prize.

The 200 foot race was won by Bro. Baldwin. This race was for linemen only.

The three-legged race was won by Bros. Collins and Collins. Married ladies' race was won by Mrs. Ben Baldwin. Young ladies' race was won by Miss N. Ferguson. Other games and contests too numerous to mention were carried on.

It would be well to state here for the benefit of other Locals that a picnic is a very uncertain undertaking, as for instance had it rained on that day, No. 9 would probably have been in debt for two years and might never have recovered. Last year at our picnic at Elgin, Ill., we paid out $1,100.00 before a cent was taken in. Had it rained that day we would have been completely swamped. A dance is different, as people can get to the hall no matter how bad the weather may be, and consequently the parties giving it do not run the chances they do at a picnic.

Well, Brothers, Chicago at present, if you will allow me to use the expression, is completely on the "bum." Work is at a standstill. "Election, Oh this election."

The Chicago Telephone Co. in the past three months has laid off over 250 men in the construction department, leaving only about 25 men at work on the South Side and about 10 on the North Side. This may sound fishy to parties or brothers who know that this company employ steadily about 300 men, but nevertheless it is a fact. McKinley, McKinley, you professed friend of the slave. "Oh Hanna," we hope to make you suffer November 3.

I will not enter into politics in this letter as you will find another letter in these columns that touches on politics. But, brothers, I do feel guilty and I am almost ashamed to face my fellowman, when I have to tell him that in the past I have been supporting these goldbugs by casting my vote for them for the past twenty years.

If the boys know any place where linemen are in demand, let us know. We can send them.

A. M'FARLANE, Press Sec'y.

UNION NO. 10, INDIANAPOLIS, IND.

Having been elected to the office of Press Secretary to fill a vacancy, I will endeavor to let the brothers know that No. 10 is still in existence.

Work is very slack here. In fact there is none, so I would advise any members looking for work to look elsewhere, before coming to Indianapolis.

The election has brought a number of No. 10's old members home to vote. Among them are C. A. Hayes, formerly president of No. 10; W. O. Dudley, formerly recording secretary; Elsworth Curtis, Ed. Williamson and Chas. Luckenbill. All the boys seem to be in good health and none of them "broke" in spite of the hard times.

No. 10 is having a hard fight to pull through the hard times, but we are still living on hope and conndence.

Bro. Ed. Hartung was accidentally shot in the leg while hunting, but is getting along very nicely and will probably be able to work again in a few days.

The majority of the boys are very blue over the way the election went, but are taking their medicine like men.

Well, I guess I will have to pull the switch for this time, and leave the circuit open for a while.

E. T. BUSSELLE, Press Sec'y.

UNION NO. 17, DETROIT, MICH.

Once more we bob up serenely, but brothers, I hardly know what to send to the Worker this month, as every common topic is swallowed up by the great political questions of the day, and as this letter will not be published until after election, I will not, therefore, go into the great silver question, but will simply write a few items pertaining to our craft in "Pingree's Potato Patch" town.

The delegates to our last convention will be pained to hear that Bro. W. C. Shuart, the "giant of the convention, has suffered from an affection of the head, which has rendered him almost totally deaf for quite a period, but hopes are entertained of the ultimate recovery of his hearing. Poor Bro. "Billie" has had it hard the last few years.

I should have announced the fact before that Bro. Phin Armstrong has taken unto himself a wife, a very estimable young lady. I hope all brothers will join me in wishing Mr. and Mrs. Armstrong a long life of happiness and prosperity, and I will also say that Detroit is noted for its fair women, so if there are any lonesome electrical workers in the Brotherhood, they will please take notice.

We are getting ready for our fifth annual ball, to be given in Arbeiter Hall in a few weeks. We would like to have some of the boys from the nearby cities shake their heels with us, especially those from No. 8 of Toledo, No. 78 of Saginaw and No. 75 of Grand Rapids. Come up boys and we will give you a good time. The date will be announced in the next Journal.

Bro. E. L. Hawes wrenched his back very severely while at work recently, but is improving rapidly and he hopes to be all O. K. before long.

Bro. James Runkle is in Ann Arbor now helping to put in a new electric railway line. Jimmie is an all-around man in the business, and a very devoted Unionist.

We are beginning to improve in many ways. The brothers are all taking an increased interest. There is a good attendance and very little of the old-time hair-splitting disputes we used to have, and new members are coming in regularly. The dawn has followed darkness, and it is all due to the few good loyal Union men who, in the days of adversity which we passed through here, stood shoulder to shoulder, with hearts of oak and steered the old ship No. 17 into a safe harbor, where, by the Eternal, we propose to keep her anchored.

DAN E. ELLSWORTH, Press Sec'y.

UNION NO. 18, KANSAS CITY, MO.

As it has been some time since anything has been given the Worker from No. 18, I will endeavor to give a few notes. To begin with, we gave our fifth annual ball at Casino Hall Monday evening, November 2, and take pride in saying that it was a gratifying success. As usual, the hall was beautifully decorated and illuminated, this being a distinct feature of our dance. At the end of the hall a monster horseshoe was built, studded with 225 incandescent lights; the body decorated with red bunting; the heel and toe calks with blue bunting, and in the center of the shoe the word "Welcome" made with white porcelain knobs trimmed with dark blue bunting, each letter being illuminated with a red incandescent light. Under the word "Welcome" hung our charter, decorated in national colors. Under the horseshoe was placed a table made of all sizes of knobs. Upon this sat a nicely polished stand fixture with a 32-candle power lamp trimmed with a nice ornamental shade. This represented the new way of lighting. A small electric plant complete in all details was built in one corner of the hall and from this wires radiated in all directions, while long festoons of lights in varied colors extended across the room from all sides. A switch-board complete in every detail was built and arranged so as to switch the 625 incandescent lights from the plant in the hall to the Edison wires to avoid being in the dark in case of an accident. Resistance boxes were so arranged that lights could be cut down to almost no candle power.

Our banner swung from the ceiling in the center of the hall, was likewise the center of attraction. It is safe to assert that Casino Hall was never more brilliantly illuminated.

At 9 o'clock sharp the grand march began. It was led by the "Colonel" and Miss Susie Boyle, who were ably seconded by Mr. and Mrs. C. F. Drollinger. Over one hundred couples participated in the march, and the crowd kept pouring in until over two hundred couple were present. Dancing continued until 1 o'clock and everyone went home well satisfied with their evening's enjoyment. Prof. Lee's orchestra of eight pieces furnished music for the occasion.

The different committees who did so much to make the ball the success that it was, consisted of the following members: Executive Committee—C. F. Drollinger, chairman; H. S. Shinn, W. H. Finch, T. H. Curphy, I. C. Underwood. Reception Committee—H. Watrons, W. L. Hutchison, A. Watkins, F. B. Jackson. Floor Committee—C. H. Adams, J. H. Lynn, A. G. Knowlton, J. E. Finch, E. B. Christie, F. J. Schodel. Floor manager, J. J. Lynch.

No. 18 feel grateful towards the Edison Electric Light Co. for their kindness in donating the power, lamps and other apparatus that went to make up our display. We also desire to thank the W. T. Osborn Electric Co. for their kindness in throwing open their shop and storeroom to us.

Bro. E. B. Christie says that he will wait till the car stops the next time. He says that there are some hard-hearted people in this world.

The "Colonel" had to walk home the night of the fifth annual. My, but it is very lonesome out in the country about 3 o'clock in the morning.

Died April 1, 1896, Press Secretary of No. 18. He was a member in good standing.

There is nothing doing. No. 18 is merely existing to save funeral expenses.

THE COLONEL.

UNION NO. 26, WASHINGTON, D. C.

No. 26 seems to be getting along very well and we have not a man out of work at the present time and prospects are very good for the future. We expect to add some new members shortly.

Harry H. Walker, while working at the Columbia Theater fell from an iron girder to the floor below, and was instantly killed. Little is known of Mr. Walker, but according to a statement made by him some time ago, it was learned that he was an electrician by trade and has relatives in Massachusetts and Georgia, and any member of the N. B. E. W. who knows anything of Mr. Walker's home or relatives will confer a favor by sending such information to

S. M. WILDER, Sec'y. No. 26
508 Eleventh St., N. W.,
Washington, D. C.

J. T. Kelly, Grand Secretary:

I am authorized by Local Union No. 26 to notify you that John M. Berger has been expelled from Union No. 26, and also to instruct you to publish same in next issue of the Electrical Worker. He was expelled for violating Art. XXVIII., Sec. 2 and 3 of our constitution.

R. F. METZEL, Fin. Sec'y.

UNION, NO. 27, BALTIMORE, MD.

Local No. 27 has been busy working for the good of the Union for some time, and has gained some very good points, but am sorry to say we have some very important trouble to settle yet. We are, as all other Locals (I imagine), supplied with a large number of lukewarm members, who will allow their foreman to dictate to them in every question they chance to have to decide, and in some cases the men are compelled to comply with a foreman's wish or jeopardize their positions, but by close observation I have found that in the majority of cases those men who insist on dictating to their men are of very narrow minds and not over-competent to hold the positions they are filling. We hope some day the companies will realize the importance of having men in whom they can depend for a safe and respectable piece of work, for it is always as easy to do good work as bad work.

The past has been a very eventful week with the boys of No. 27, not only on account of the Presidential election, but the city election as well, for the last City Council appropriated $1,000,000 for laying conduits preparatory to putting electric light and other wires (in the city of Baltimore) under ground. The boys all worked manfully against the city doing such work, knowing that it would cost about ten times the amount appropriated for the work, and also that if the city did it, there would in all probability be much discord and any amount of dissatisfaction, and many law suits with the various companies who are making the ducts, for not only will they have to pay the necessary rental, but they will likely be confined to such a small space that it will be impossible for a man to do any repairing on any of wires that chance to be in the back far side of the duct, and if the ducts laid like the ones the city has laid their fire alarm wires I don't think a prudent man will risk his life so far to venture into a hole where 2,000 vo of current is passing. Notwithstandi all the disadvantages we could sh against the ordinance, it became a la and the city will proceed to lay ducts. We will see how far they v get with the money they have, a also what it will cost to complete work, and lastly, what satisfaction th will give and what benefit is derived the city. We are glad to say that it not the fault of the companies, for th were willing to lay their own condu at their own expense.

I hope the boys will indulge me a tle, as I wish to return to a subject th I have already spoken of. Those w may chance to read this letter will that I am comparatively young in cause of Unionism. But, brothers, tell you there is more selfishness a personality used in organized labor, well as in business, than we will beli at first glance. I have seldom seen tr ble occur that some one did not ha preference, and is led by personal sires beyond all bounds of parliam tary law or justice, and will do thi unbecoming to any member of an ganized body of men or a citizen of United States.

Now, I would like to hear some express his views on this subject, an think if every member of organized bor will think of his pledge of hon not only to the organization to which may belong, but as an American citiz he will leave many things undone th he may otherwise do.

CHAS. P. TAYLOR, Press Sec'y

"LINEMAN" CALLED DOWN.

Editor Electrical Worker.

I wish you would kindly give this ter as prominent a place in your n issue as you did a letter in the Octo number, signed by a party (I cannot man) calling himself "Lineman." I a member of Local Union No. 35, B ton, Mass., and one who has the welf of the Union and its members at hea and not ashamed of my name. I n not be able to express myself in language of "Lineman," but will try a not be misunderstood. I think the ter of "Lineman," if left unanswer would reflect very much on our Uni especially when we consider the f that two of the three men whom he s were discharged for being in the para Labor Day (which is the meaning he signs to convey to your readers, a which by the way is utterly false) at present working for the N. E. T. a T. Co. in this Division.

I think I voice the sentiment of Union as well as myself when I exon ate Mr. Cameron from all blame in laying off of these men. We have tr to find out who "Lineman" is, but as have been unable to do so. He is pr ably one who thinks he has some gri ance against the company, or Mr. Ca eron, for perhaps having been dischar at some time, and wants to work spite out through our Union, which I one will not allow. Who, or whate he is, he has certainly missed his call for a person who can read faces, and

hat same reading tell what people are hinking about, as he did on the day of he parade would surely make more noney as a mind-reader, or a detective han he could possibly make as a line-nan, and the Union would be better without him.

It might be well to state that at the present time the N. E. T. and T. Co. have in their employ more Union men than any other electrical company in his State, and I would not be surprised if they employed more Union men than all the other companies combined, and I do not think that it is at all consistent with the welfare of the Union or its members, to assail any of its officers for some fancied wrong by such letters as that written by "Lineman."

Think before you commit yourself on paper, and always remember that you are men and better still, gentlemen, and when you have anything to write, do not be ashamed to sign your names to it like a man.

Trusting that I will see this in your next issue, I am,

D. A. M'GILLVRAY,
A Member of L. U. No. 35.

UNION NO. 38, CLEVELAND, O.

No. 38 has had rather bad luck this month. We have had three members badly burned. B. F. Murrin and H. E. Ott were doing some repair work in the powerhouse of the Cleveland Electric Street Railway and got the positive and negative leads crossed and both were badly burned. Murrin's mustache and eyebrows were burned off and his face quite badly burned, while Bro. Ott's arm was severely burned. Bro. Wm. Mills was doing some repair work on an alternating circuit, and while cutting a wire put his hand on the cross-arm, which, he says, was wet or the paint carried the current, for it caught him and he fell about twenty feet, breaking his leg in three places just above the ankle; he also received internal injuries and injured his spine.

Bro. McClellan burned his hand quite badly, but I cannot give the particulars, as I have not seen him.

Election makes things quite lively around Cleveland—I mean with arguments. I was down to hear Mr. Debs the other night, and they claim there were 10,000 in the hall, and twice as many outside; for myself, I had to climb the fire-escape and got in the third story window. I would climb twice as far to hear him again, although it was not the first time I heard him, for I never miss an opportunity to hear him.

Any brother knowing the whereabouts of William Cunningham would greatly oblige by writing to No. 38.

IRA MISENER, Press Sec'y.

UNION NO. 41, PHILADELPHIA, PA.

Our Local is in a very poor condition now. Many of the members are becoming disgusted with the way things are going. Something must be done, and done soon at that. Our membership is fast falling off, the meetings are growing smaller. The number of delinquents is growing larger. In fact the situation is growing very serious.

General Sherman once telegraphed to General Grant: "We have them where we want them if we push things." General Grant answered: "Push things." This I think is the proper thing to do at the present time. Push things, for all they are worth. Push the movement being made in regards to a social organization and we will then have something to attract the brothers and a place where they can go at any and all times. It will save money for our brothers who get out of work, because it will keep them off the streets and out of saloons, and when there is any work we will know just where to go to find them. The organization will be more fraternal, personal prejudices will be entirely forgotten, and all electrical workers will consider it an honor to be a member of our Local and social organization.

In my last letter I neglected to state that Bro. Jack Simmons was also elected a delegate to the Building Trades Council, which body is very busily engaged in advocating the rights of organized labor.

Things have been very dull here for the past two months. I suppose all pending on the battle by ballots, which has been nobly fought. Everything will surely brighten up now.

The Cutter Electric Mfg. Co. previous to the election laid off forty men (some of whom had not lost a day in four years) with instructions to show up Thursday following, if McKinley was elected; otherwise they need not put in an appearance. It is needless to say that the men showed up and are busily engaged in filling orders which they would not be doing in the event of Bryan's election.

I suppose Bro. W. H. Kelly of No. 45 is now satisfied as to my competency as a judge, even if my home is a Republican nest. I am happy to note that there are a few other Republican nests in this great country. Bryan's home for instance was not an Anarchial ranch for revolutionists of his kind.

As regards qualifications, I admit I am not qualified to teach such bright men as he what has caused hard times or his duties as an American citizen as good as myself. But all members of this Brotherhood are not as bright as he, and do not know it all. "It was for their benefit that I advocated what I thought would be best for us all." As free-born American citizens, I think we all have a right to speak according to the dictates of our own conscience without being personally attacked in any ungentlemanly manner by a brother secretary. No. Emphatically, no. A party fund is not necessary to induce me to advocate something which involves the country's honor. Something which means that national honor must be vindicated; that every department of the Government will be maintained in its integrity; that revolution is rebuked; that repudiation is dead; that mob law will not be tolerated, and that American people will preserve their honesty, for they have shown the world that they are not a nation of thieves and anarchists. And when this brother secretary of No. 45 goes so far as to call me a "sucker" he forgets that I am a brother of the organization. He also forgets that there are people outside of our own members who read the Worker, and express themselves accordingly. And furthermore, when one brother call another a "sucker" he does not deserve being called a brother, and I positively do not recognize him as such.

As regards Bryan's "cross of gold" and "crown of thorns" they were long since forgotten, and it was that fatal cross made by the lead pencil on the 3rd day of November that crushed him and his free silver hobby.

Yes, and we even landed "Sandy."

D. S. LOCHER, Press Sec'y.

THE GREAT AND ONLY LOCAL, NO. 44.

Bro. James Bennett has returned to his old love, the American Bell, and is at present stationed in Buffalo We understand that "Jim" is still raising chickens.

The Gas and Electric Co. is laying a new main through Exchange place. Bro. Pratt is in charge of the work.

The biggest item in the electrical world in Rochester is the fourth annual ball and electrical display of Local No. 44, N. B. E. W., at Fitshugh Hall, November 26th, 1896. It is going to be the biggest success we have ever had, for all the boys are working hard, and Bro. Jack Maguire is "pushing it along." The decorations and electrical display are in charge of a committee of one from each shop, with Bro. Breese at the head. We expect that Bro. Moore will have a nice little booth, where all who want to look at their liver with the X ray machine can be accommodated. The electrical display is going to be fine enough for anybody whose feet (like your scribe's) are not mates to get the worth of their money without any dancing, and those that can dance will get a bargain.

Will tell you more about it "after the ball."

Well, as I said in my last letter, we got the banner, and it is a "bird." There wasn't one in the parade that could touch it. Had our own band, too. If any had doubts about 44 being in good shape, and weren't satisfied with our showing that day, they want to come around and see us, and as many of our friends as can get on the floor of Fitshugh Hall, "trip the light fantastics" November 26th.

We are glad to be able to state that Bro. George Hearn is on deck again, after his long illness.

The report that President Guerinot and Bro. Horton are going to start a German school is totally false, and both brothers deny having any such intentions.

Don't fail to get these items in the November issue, or Bro. Frank Kehoe will be after the scribe with a sharp stick..

FRED FISH, Press Sec'y.

UNION NO. 48, FT. WAYNE, IND.

A good little Union was organized here by Bro. Charles Moore of No. 2. We have at present about twenty-six members, and we average two or three initiations every meeting. Our men are mostly "old-timers," and we expect to have as lively a little Union as there is for a good many miles around. Bro. Chas. Moore, generally known as "Fordy," has left us and gone to Chicago to loaf at the Garden City and rest up for next season.

The work for the new telephone company is almost finished, and a lot of the boys are thinking of leaving for greener pastures.

The well known "Brockie Brooks" was sent over the road for two years to the Michigan City pen. He got tangled up

with a horse and buggy and too much whisky, and got a two years' lay off, and is not working for the "long distance" people any more. He is making chairs and shoes and doing inside graining for a firm that don't lay off a man. Too bad, Brockie, old boy, but may be it will be a lesson to you.

Bro. C. F. Kent, of No. 9, is general foreman here, and he understands how to treat a Union man. Every man doing line work on the job is a Union man.

Bro. Lyckholm left us the middle of last month and went to Butte, Mont., and word comes back that he is State foreman for the telephone company there. That's right, Pete, old boy. Let the good work go on. If a few more good Union men get such jobs, it will be no trouble at all for all Union men to get work.

Some of the boys are laying plans to go to Atlanta, Ga., to work for the Home Telephone Co. before the winter snow flakes begin to fall. Look out, No. 29, you are going to have visitors. Don't forget to keep us posted as to when that work commences.

JOHN "RED" DUNCAN, Press Sec'y.

UNION NO. 66, HOUSTON, TEX.

There is not much news from No. 66 this month, but the boys are all at work and enjoying good health.

There has been so many circusses and picnics here lately that the boys have been very busy watching the elephants and taking their girls to picnics. We have our meetings regularly every Monday night with a good attendance. The boys all take great interest in the welfare of the Union and try to help each other as much as possible.

Bro. H. W. Hereford had the misfortune to lose his mother on the 15th. The boys all turned out to the services and assisted him in every way possible.

We are about to get two or three new members, but cannot say much about it this time, as I am not sure as to how many we will get, but will tell you more about it in my next letter.

If Bro. Geo. Crossley is anywhere in existence, we would like to hear from him as the boys think he is dead or gone astray. They don't know which.

W. V. FISK, Press Sec'y.

UNION NO. 67, QUINCY, ILL.

News is very scarce in Quincy at present. The telephone boys were here for a few days, but have gone to work on a toll line from here to Springfield, Ill.

Bro. A. B. Otis paid Qunicy a short visit a few days ago. He is still at Clayton helping install a new plant there.

We still find a new light for our circuit occasionally. We added two recently. Bro. Lou Constance has also had a new light added to his family circle. It's a bouncing girl and has come to stay. You ought to see the unerring aim with which Lou guides the carriage through the crowded streets. We are not able to say just how many curbstones he hits or how many crossings he misses, but he gets there and back just the same, as an old man would.

While trimming a guy stub for the Telephone Co. Bro. "Ed" Hays met with a painful accident. The drawing-knife slipped and cut his leg near the knee, inflicting a painful wound. He was laid up about three weeks, but is at present able to be out again.

As we said news is very scarce with us, owing to the fact that your humble servant has been laid up for over seven weeks with sciatic rheumatism, but the last week, with the help of battery and other electrical appliances graciously furnished by Bro. Wm. Hickman, we are improving rapidly and hope to be able to go to work soon. We wish to thank Bro. Hickman for his kindness. Also the rest of No. 67 for kindness shown us. It has been truthfully said. "A friend in need is a friend indeed."

(November.)

We will try our lights once more and see how they work on McKinley. We must have jumped a cog in some way as our items are a month behind, but we will try to get things straightened out now. We are out after a two-months' tussle with sciatica, and right here we wish to tell the world that the brothers in No. 67 are all right and strictly up to candle power, as we received our sick benefit regularly. Not only that, but the boys were very good about coming in to spend a few minutes, if no more. They came every time they had a chance. We wish to thank the members of No. 67 through the Worker for kindness shown and benefits received.

Our President, Bro. D. M. Mallinson, has all he can do, but has a gang sufficient to keep things going. The T. H. Lt. Co. has its new building about completed. The Telephone boys have not been in Quincy for some time. Bro. A. B. Otis is at Clayton.

I see by my last Worker that Bro. "Will" Courtney of Dallas, Tex., was instrumental in organizing a Union there. Will is a Union man through and through.

I do hope Mr. Hanna won't be able to disorganize labor unions as some predict he will do and say he has done. Let us put our shoulder to the wheel and see to it that he don't do it. He beat Bryan out of the Presidency, but he can't beat all labor unions. I can't help but think that organized labor was blind to its own interest, but let me just say Hanna's boodle did it, and stop at that.

Nearly all the members of No. 67 have a steady position at a fixed salary. There is, of course, a few out of work, but they make some money by doing inside wiring and fixture work, but could do more if it was here to do.

C. H. M'NEMEE, Press Sec'y.

UNION NO. 78, SAGINAW, MICH.

(October.)

The hot months over, the electrical workers of this city have taken as it were, a new lease upon life. At a special meeting held last evening, there was a full attendance and it is extremely gratifying to write that a general interest prevailed throughout the entire length of the meeting. As the greater number of our members will be at work Labor Day it was deemed not advisable to turn out in parade, although a motion to send the colors of the union with the Central Labor body, was carried. Bro. Ross to be the "standard bearer."

The Rapid Transit Railway Company, the intention of which is to run between Saginaw and Bay City, has at last secured a franchise and will soon commence operations.

The terrible storm which struck th section not long since, made it possib for us to visit with a number of stran brothers, which to us was somewhat an offset to the terrible damage wreak by the elements.

(November.)

Business of importance called my a tention after writing the letter whi should have appeared in last month journal, and in consequence will ask y to publish that as well as the one I a now writing, in the present number.

The Union here is booming. We h set our annual for October 15, but t committee to whom the arrangemen were left, thought better to postpone until a month later.

The Rapid Transit Railway Compan of which perhaps I have written t much, did not live up to agreements, a have had their franchise revoked. It said by the enemies of the company th their scheme was to compel the Inte Urban to buy them out, and that failin they have evacuated.

I am much pleased to once more wri that everything is all right in our li and that all members of the Union a at work.

GEO. S. CRABBE, Press Sec'y.

LOOK OUT FOR HIM.

Ingomar, O., Nov. 9, 1896.

While I was working for the Centr Union Telegraph Co. at Dayton, O., short time ago, Chas. Rinehart, wh claimed to be a charter member of o of the St. Louis Unions, got a job wi us and worked one week and quit. T night following he was quite ill and t landlady where we were rooming did she could to alleviate his pain. The ne morning I left for Troy, O., and told t landlady to hold my clothing until came back. On returning three da later, I was shown a forged order whi Rinehart had given for my clothes, so was out about $45.00. The police fou the clothes where he had pawned the but I had to pay to get them out. also stole my emblematic button, whi he will probably wear and try and pa as a member. He is not only a thi but a forger. He claims to have re tives in Mobile, Ala. He is slightly low on left shoulder, smooth shaven, limps little, has a retreating chin, narrow eye is about five feet eight in height, and h a sputtering, hesitating way of spea ing.

Chas. Rinehart is the most unprincipl man I ever met and such conduct d stroys the confidence of strangers in honest linemen, and it is getting to so that all are looked upon with su picion.

C. H. MORNINGSTAR,
Member of No. 1.

(Chas. Rinehart was never a memb of the N. B. E. W. He was probably o of the freaks who blew into St. Lou after the cyclone, and may have tended some of the open meetings whi we held at that time. Frequent co plaints like the above are received this office. If our members would u ordinary business precaution, they wou not be so often imposed upon, for a member of the Brotherhood can easi tell, if he understands the secret wo of our organization, whether a pers claiming to be a member is all right not.)—Ed.

Directory of Local Unions.

(Secretaries will please furnish the necessary information to make this directory complete. Note that the *time* and *place* of meeting, the name of the President, the names and *addresses* of the Recording and Financial Secretaries are required.)

No. 1, St. Louis, Mo.—Meets every Tuesday at s. e. cor. 21st and Franklin avenue. F. P. Kinsley, Pres., 1801 Morgan st.; W. S. Peebles, R. S., 5147 Wells ave.; J. P. Casey, F. S., 2702 Spring av.

No. 2, Milwaukee, Wis.—Meets 1st and 3d Saturdays at n. w. cor. 3d and Prairie sts., 3d floor. M. J. Quirk, Pres., 87 27th st.; J. W. Peterson, R. S., 450 9th st.; Geo. Poehlman, F. S., 647 24½ st.

No. 3, Denver, Col.—E. L. Layne, Pres., 1011 19th st.; Geo. P. Manning, Sec., 1633 Lawrence st.

No. 4, New Orleans, La.—Meets 1st and 3d Tuesdays at Carondelet and Perdido sts. J. McGregor, Pres., 2111 Rousseau st.; C. M. Hale, R. S., 630 St. Mary st.; R. B. Joyce, F. S., 331 S. Bassin st.

No. 5, New York City, N. Y.—Meets every Thursday at 85 E. 4th st. John F. Bergen, Pres., 528 Henry st., Brooklyn; R. J. Baker, R. S., 98 Henry st., Brooklyn; M. E. Bergen, F. S., 515 Henry st., Brooklyn.

No. 6, San Francisco, Cal.—Meets 2nd and 4th Wednesdays at Forester's Hall, 20 Eddy st. D. Keefe, Pres., 318½ Clementina st.; R. P. Gale, R. S., 1004 Larkin st.; A. F. Irwin, F. S., 425 Geary st.

No. 7, Springfield, Mass.—Meets 1st and 3d Wednesdays at room 30, Theatre Blk. Wm. Gregg, Pres., 138 Patton st.; Jos. McGilvray, R. S., 190 Chestnut st.; G. T. McGilvray, F. S., City Hotel.

No. 8, Toledo, O.—Meets every Tuesday at Friendship Hall, cor. Jefferson and Summit sts. P. Crowley, Pres., 512 Vance st.; Jas. Burns, R. S., 1218 Broadway; W. Welsh, F. S., 1907 Cherry st.

No. 9, Chicago, Ill.—Meets every Saturday at 184 E. Madison st. C. D. Hatt, Pres., 5930 State st.; L. Christenson, R. S., 1043 S. Irving ave.; C. W. Beach, F. S., 5931 Sangamon st.

No. 10, Indianapolis, Ind.—Meets 1st and 3rd Monday at 29½ W. Pearl st. John Berry, Pres., care of headquarters Fire Dept.; E. Bussele, R. S., 80 W. Ohio st.; E. C. Hartung, F.S., Rooms 5-7 Cyclorama Bldg.

No. 11, Terre Haute, Ind.—Meets 2d and 4th Tuesdays at 8th and Main sts. C. D. Updegraff, Pres., 529 S. Niuth st.; M. Davis, R.S., 918 N. 9th st.; W. H. Schaffer, F. S., 114 N. 14th st.

No. 12, Evansville, Ind.—Meet every Tuesday at cor. 3rd and Sycamore st. Harry Fisher, Pres., 200 Clark st.; A. L. Swanson, R. S., 1054 Water st; A. N. Grant, F. S., 202 Clark st.

No. 14, Memphis, Tenn.—Chas. E. Blake, Pres., 70 Mulberry st.; J. A. Myles, Sec., 207 De Soto st.

No. 15, Philadelphia, Pa.—Meets every Tuesday at 711 Spring Garden st. E. G. Boyle, Pres., Penn. Farmers' Hotel. 3d and Callowhill sts.; E. Hennessy, R. S., 1518 French st.; Chas. T. Lang, F. S., 829 Race st.

No. 16, Lynn, Mass.—Meet at General Electric Band Room, 9½ South st. Jas. Robson, Pres., 56 W. Neptune st.; C. W. Perkins, R. S., 6 Allen's Court; E. J. Malloy, F. S., 86 Cottage st.

No. 17, Detroit, Mich.—Meets 1st and 3d Thursdays at Trades Council Hall, 224 Randolph st. T. H. Forbes, Pres., 1104 13th st.; F. Campbell, R. S., 405 Abbott st.; J. G. Forbes, F. S., 745 Milwaukee av. W.

No. 18, Kansas City, Mo.—Meets every Friday at 1015 Walnut st. C. H. Adams, Pres., 612 Wall st.; T. W. Curphy, R. S., 716 Delaware st.; J. H. Lynn, F. S., 1632 Jefferson st.

No. 19, Chicago, Ill.—Meets 1st and 3d Tuesdays at 6512 Cottage Grove av. F. Conklin, Pres., 7022 S. Chicago av.; T. J. Prendergast, R. S., 7119 S. Chicago av.; J. Drouim, F. S., 9258 Anthony av.

No. 21, Wheeling, W. Va.—Meets 1st and 3d Tuesdays at Trades Assembly Hall. H. F. Wyse, Pres., Box 111; C. L. Ullery, R. S., Box 111; W. J. Clark, F. S., McClure House.

No. 22, Omaha, Neb.—Meets every Friday at Labor Temple, 17 Douglas st. J. W. Watters, Pres., 2211 Pierce st.; M. J. Curran, R. S., 1814 St. Mary's av.; M. T. Castor, F. S., 422 S. 18th st.

No. 23, St. Paul, Minn.—Meets 2d and 4th Fridays at Labor Hall, 3rd and Wabasha sts. Jno. O'Donnell, Pres., 4th and Wabasha sts.; Thos. O'Toole, R. S., 333 E. 6th st.; F. Volk, F. S., 175 W. 6th st.

No. 24, Minneapolis, Minn.—Meets 1st and 3rd Wednesdays at 34 and 36 6th st. S. Geo. Heilig, Pres., 18 9th st.; L. R. Stevens, R. S., 18 Western av.; A. Aune, F. S., 3129 Longfellow av.

No. 25, Duluth, Minn.—Meets 2d and 4th Thursdays at room 6 Banning Blk. J. D. Hayes, Pres., care of Crowley Elect. Co.; L. P. Runkle, R. S., 414 E. 1st st. N.; Jas. F. Owens, F. S., 414 E. 1st st.

No. 26, Washington, D. C.—Meets every Friday at 827 7th st. N. W. M. O. Spring, Pres., 478 Central Power Station; S. M. Wilder, R. S., 508 11th st. N. W.; R. F. Metzel, F. S., 509 11th st. N. W.

No. 27, Baltimore, Md.—Meets every Monday at Hall, cor. Fayette and Park avs. P. H. Wissinger, Pres., 741 W. Fayette st.; M. V. Wright, R. S., 1427 Asquith st.; F. H. Russell, F. S., 1408 Asquith st.

No. 28, Louisville, Ky.—Meets 1st and 3d Tuesdays at Beck Hall, 1st st. near Jefferson Calvin Beach, Pres., 1020 W. Market st.; Ed. Herpt, R. S., 607 Magnolia st.; Jno. C. Deibel, F. S., 418 15th st.

No. 29, Atlanta, Ga.—Meets every Sunday at 61½ Alabama st. Geo. Foster, Pres., 100 Walker st.; D. J. Kerr, R. S., 114 Richardson st.; Geo. Raymer, F. S., 121 Rhodes st.

No. 30, Cincinnati, O.—Meets 1st and 3d Mondays at 136 E. Court st. W. Williams, Pres., 605 Broadway; H. C. Genrich, R. S., 420 E. 5th st.; J. F. Harmuth, F. S., 2158 Vernon st., Clifton Heights.

No. 31, Jersey City, N. J.—Meets 2d and 4th Thursdays at 116 Newark av. Thos. Watson, Pres., 513 Jersey av.; F. J. Anderson, R. S., 228 Washington st.; T. L. Jones, F. S., 137 Grand st.

No. 32, Paterson, N. J.—Meets 1st and 3d Mondays at German Union Hall. J. F. Colvin, Pres., 963 Madison av.; Jos. Maher, R. S., 348 Grand st., Paterson Heights, Paterson, N. J.; John Kane, F.S., 274 Hamilton av.

No. 33, Newark, N. J.—Meets every Monday evening at No. 58 Williams st. W. J. Curtis, Pres., 12 Beach st; J. M. Eder, R. S., 180 Market st.; W. E. Rosseter, F. S., 175 Sherman av.

No. 34, Brooklyn, N. Y.—Meets 2d and 4th Fridays at Peters' Hall, 360 Fulton st. E. W. Latham, Pres., 151 Gates av.; G. M. Leggett, R. S., 281 Adelphi st.; G. C. Paine, F. S., 151 Gates av.

No. 35, Boston, Mass.—Meets every Wednesday at Well's Memorial Hall, 987 Washington st. M. Birmingham, Pres., 69 Dustin st., Allston; E. Colvin, R. S., 258 Lincoln st., Allston; R. H. Bradford, F. S., 6 Temple st.

No. 36, Sacramento, Cal.—Walter Ross, Pres., 1030 G st.; R. A. Fisk, R. S., 1324 3d st.; Gus. Flannigan, F. S., 911 L st.

No. 37, Hartford, Conn.—Meets 1st and 3d Fridays at Central Union Labor Hall, 11 Central Row. M. F. Owens, Pres., 63 Hawthorne st.; D. F. Cronin, R. S., 49 Windsor st.; C. E. Byrne, F. S., 16 John st.

No. 38, Cleveland, O.—Meets every Thursday at 393 Ontario st. P. P. Hovis, Pres., 163 Central ave., Tom Wheeler, R. S., 378 Franklin av.; J. E. Suloff, F. S., 28 Norton st.

No. 39, Providence, R. I.—Meets 1st and 3d Mondays at Phœnix Bldg, 157 Westminster st. H. B. Kelly, Pres., 1950 Westminster st.; M. L. Carder, R. S., 40 Wilson st.; G. D. Higgins, F. S., 8 Carpenter st.

No. 40, St. Joseph, Mo.—Meets every Monday at north-west corner 8th and Locust sts., "Brockaw's Hall." R. M. Martin, Pres., 1702 N. 3d st.; Wm. Dorsel, R. S., 1708 Calhoun st; J. C. Schneider, F. S., 808 S. 5th st.

No. 41, Philadelphia, Pa.—Meets every Thursday at n. e. cor. 8th and Callowhill sts.; Geo. A. Neal, Pres., 3626 Wharton st.; E. H. B. Chew, R. S., 2953 N. 15th st.; W. C. Fisher, F. S., 2854 Park av.

No. 42, Utica, N. Y.—Meets 2d and 4th Tuesdays at room 5, Western Union Bldg. L. S. Ward, Pres., room 5, Western Union Bldg.; E. S. Allen, R. S., room 5, Western Union Bldg.; C. Richardson, F. S., room 5, Western Union Bldg.

No. 43, Dayton, O.—J. J. McCarty, Pres., care of Fifth St. R. R. Co.; L. O. Williams, R. S., 1135 W. 3d st.; F. DeWitt, F. S., 420 E. 2d st.

No. 44, Rochester, N. Y.—J. C. Guerinot, Pres., 120 Campbell st.; H. W. Sherman, R. S., 1 Bauer pl.; Fred Fish, F. S., 123 State st.

No. 45, Buffalo, N. Y.—Meets 1st and 3rd Saturdays at 512 Washington st. Frank Hopkins, Pres., 81 Swan st.; J. O'Connell, R. S., 614 Fargo av.; C. E. Stinson, F. S., 21 Terrace st.

No. 46, Reading, Pa.—Lucian Bowman, Pres.; Harry Weidner, R. S., 225 Pearl st.; W. S. Hoffman, F. S., 109 Peach st.

No. 48, Ft. Wayne, Ind.—Meets 1st and 3rd Fridays at cor. of Main and Clinton sts. R. Bartel, Pres., Hotel Tremont; A. J. Lathouse, R. S., 65 Hoffman st.; G. B. Taylor, F. S., 31 Douglas av.

No. 49, Bloomington, Ill.—Meets 2d and 4th Mondays at Trades Assembly Hall. C. F. Snyder, Pres., Box 1015; W. C. Gorey, R. S., 409 S. Lee st.; W. F. Witty, F. S., 303 N. Gridley st.

No. 51, Scranton, Pa.—Jas. Harding, Pres., 601 Meridian st.; P. Campbell, R. S., 1210 Irving av.; Ruben Robins, F. S., 1223 Hampton st.

No. 52, Davenport, Ia.—A. L. Wheeler, Pres., Atlantic House; J. H. Clark, Sec., 215 Iowa st.

No. 53, Harrisburg, Pa.—C. A. Swager, Pres., 115½ Market st.; Jas. Emminger, R. S., 25 N. 15th st.; C. Anderson, F. S., 45 Summitt st.

No. 54, Peoria, Ill.—Meets 1st and 3rd Wednesdays at 301 Main st. H. Schearer, Pres., 219 W. Jefferson st.; Harry Dunn, R. S., East Peoria; L. C. Crawley, F. S., 115 Washington st.

No. 57, Salt Lake City, Utah.—Meets 2d and 4th Wednesdays. R. Blayr, Pres., 224 W. 1st South st.; John Poland, R. S., 224 W. 1st South st.; E. Mill, F. S., 15 W. 1st South st..

No. 58, West Superior, Wis.—Meets 1st and 3rd Wednesdays at rooms 3 and 4 1602 3d st. R. F. Pfleger, Pres., Superior Water, Light & Power Co.; G. C. Hehl, R. S., 405 Hughitt av.; H. Burdette, F. S., 1819 Banks av.

No. 59, Paducah, Ky.—J. B. Eretts, Pres., No. 2 Engine House; W. S. Nelson, R. S., 220 S. 4th st.; W. A. Koeneman, F. S., 220 S. 4th st.

No. 60, San Antonio, Tex.—Meets 1st and 3d Saturdays, Meyers' Hall, Alamo Plaza. T. L. Rose, Pres., 215 Powder-house st.; E. Kuhlman, R. S., 222 Salina st.; C. A. Davis, F. S., 215 Travis st.

No. 61, Los Angeles, Cal.—Wm. Tubman, Pres. Station 2; Chas. Viall, R. S., Station 5; C. P. Lofthouse, F. S., 746 San Julian st.

No. 62, Kalamazoo, Mich.—A. D. Ayres, Pres., 534 S. Burdick st.; L. Bellman, R. S., 540 Pine st.; G. E. Tifft, F. S., 324 Sarah st.

No. 63, Tampa, Fla.—Theo. Glinn, Pres., Pt. Tampa City; W. F. Crofts, R. S., lock box 264; Arthur D. Henry, F. S., box 220.

No. 66, Houston, Tex.—Meets every Monday J. W. Howard, Pres., 1713 Houston av.; S. T. Sikes, R. S., 808 McKee st.; F. A. Peters, F. S., 907 Preston av.

No. 67, Quincy, Ill.—D. M. Mallinson, Pres., 1120 Vine st.; S. L. Pevehouse, R. S., 1413 Spring st.; W. F. Wagner, F. S., 641 Locust st.

No. 68, Little Rock, Ark.—C. J. Griffith, Pres., 15th and Rooker st.; G. W. Wilson, R. S., 826 Marshall st.; W. N. Drogoon, F. S., 1813 W. 3d st.

No. 69, Dallas, Tex.—Meets 1st and 3rd Saturday at Labor Hall. S. D. Claiborne, Pres., 141 San Jacinto st.; F. G. Montgomery, R. S., 190 Collins st.; Geo. Eagan, F. S., 107 S. Murphy st.

No. 70, Schenectady, N. Y.—Meets 2d and 4th Tuesdays at Trades Assembly Hall, cor. Centre and State sts. F. Litzendorf, Pres., Crane st., Mt. Pleasant; Geo. Miller, R. S., 32 Ellis st.; J. D. Betting, F. S., 626 Villa road.

No. 71, Galveston, Tex.—Meets 2d and 4th Wednesdays. J. T. Payne, Pres., 1314 Centre st.; F. J. Schallert, R. S., 2514 Church st.; G. L. Garrett, F. S.

No. 72, Danville, Ill.—G. M. Girton, Pres., 319 Franklin st.; Jas. Merritt, Sec., care of Am. Tel. & Tel. Co.

No. 73, Spokane, Wash.—Meets 1st and 3rd Thursdays at Oliver Hall, 336½ Riverside av. C. C. Van Inwegen, Pres., 1504 Boon av.; T. H. Denter, R. S., box 635; Gus. Pagel, F. S., Box 635.

No. 74, Fall River, Mass.—Meets every Monday at cor. Main and Bedford sts. W. I. White, Pres., 59 Bowen st.; Jas. Murphy, R. S., 100 4th st.; Thos. Bailey, F. S., 135 Snell st.

No. 75, Grand Rapids, Mich.—Meets 1st and 3d Fridays. J. McGoran, Pres.; Ed. Cannon, R. S., Clarendon Hotel; Geo. Higgins, F.S., 63 Pleasant st.

No. 78, Saginaw, Mich.—Jas. Hodgins, Pres., 1309 Janes st.; Robt. Crawford, R. S., 145 Gage st.; Chas. Ross, F. S., P. O. box 225, E. S.

No. 79, Austin, Tex.—Meets every Thursday night at Maccabee Hall. J. L. Vorkaufer, Pres., 1206 San Jaciuto st.; Chas. J. Jackson, R. S., Mayor's office; B. Y. Lovejoy, F. S., 109-111 E. 7th st.

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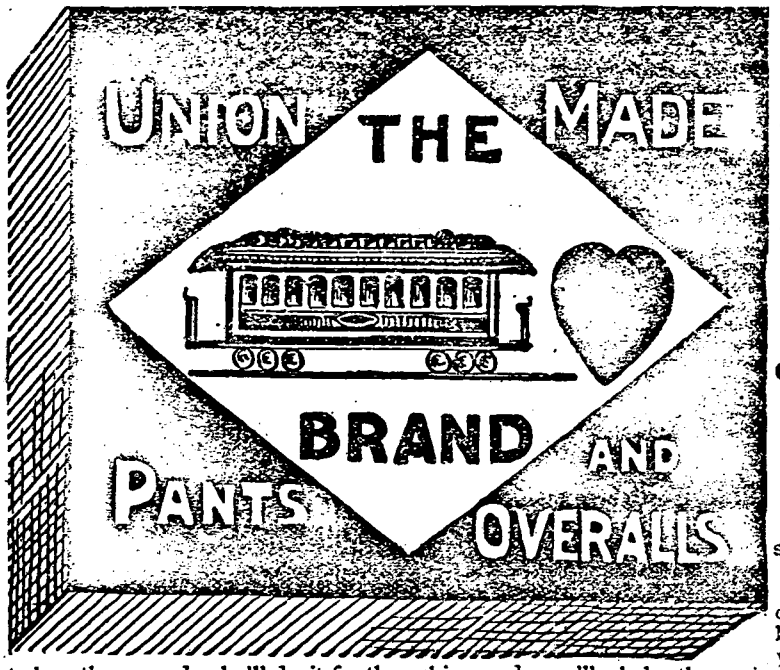

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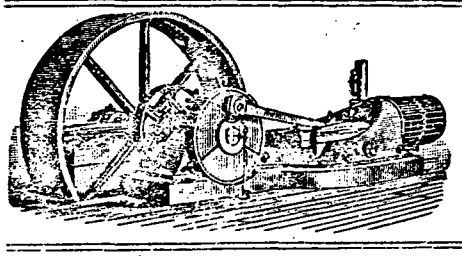

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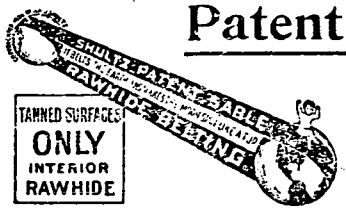

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